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FOURTEEN YEARS OF JAY WATCH DATA GATHERED ON SMALL SCRUB FRAGMENTS IN INDIAN RIVER COUNTY, FLORIDA

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Abstract.—The Florida Scrub-Jay (*Aphelocoma coerulescens*) is the only bird endemic to Florida and is now listed as imperiled under the Federal Endangered Species Act. The primary reasons for this status are the loss of scrub habitat to development and inconsistent land management. Even with the protection provided by state and federal laws, many jay populations are likely to disappear as a result of their small size and isolation from larger populations. We assessed 14 years (2007–2020) of data from Jay Watch, a statewide citizen-science initiative, in Indian River County Florida where fragmented sites range from 3.5–6.5 ha. Florida Scrub-Jay populations on these sites declined markedly and breeding success was low to non-existent. Even so, most sites were consistently occupied during the years studied and may function as reservoirs of genetic diversity and stepping stones for dispersal. We documented natural recruitment of areas followed by breeding attempts. The involvement of relevant levels of government and property associations in managing Florida Scrub-Jay habitat is vital to sustainability of these isolated populations and their genetic resources. Associated environmental education is a valuable offshoot of the monitoring.

Key words: fragmentation, Florida Scrub-Jay, Indian River County, Jay Watch, population viability

The Jay Watch Program was designed to document population trends for the Florida Scrub-Jay (*Aphelocoma coerulescens*) using a citizen-science approach. The Florida Scrub-Jay, the only bird endemic to Florida, has been protected since 1987 when it was listed under the

Federal Endangered Species Act (50 CFR 17.11), and is also protected through Florida's Endangered and Threatened Species Rule (Florida Administrative Code 68A-27.003). Jay Watch was initiated by the Lake Wales Ridge Ecosystem Working Group in 2002 with oversight provided by The Nature Conservancy and Archbold Biological Station (Miller et. al. 2015). The Florida Fish and Wildlife Conservation Commission began managing the program in 2011 (Miller et. al. 2015). Field work and volunteer training was coordinated and administered by Audubon Florida.

From 2007–2020, volunteers monitored four areas of unconnected scrub habitat in Indian River County for Jay Watch based on recommendations provided by the local Audubon chapter. One site was publicly owned and the others were privately owned and required either the permission of property owners to conduct surveys or surveys were restricted to public access roads. We assessed trends on these sites to document their status and provide information on the sustainability and potential value of small jay populations.

Methods

The Vero Lake Estates site, monitored since 2015, consisted of single-family homes dispersed across a 6-ha grid of paved main roads, dirt secondary roads, swales, and drainage ditches. Remnants of unmanaged scrub were intermixed with landscaped homes with new construction yearly. The Winter Beach/65th Street roadside site (~3.5 ha) was 11 km to the southeast and degraded quickly during our surveys with encroachment of exotic vegetation and tall pines. Development proposed for a portion of the property resulted in the denial of access for Jay Watch surveys starting in 2008. South County Park was 14 km south and owned by Indian River County. Developed primarily for ballfields and playgrounds, the park included 4 ha of managed scrub habitat. Indian River Club, another 4 km southeast and on the southern end of the county was a residential golf course community. This site had 6.5 ha of managed scrub and a long history of monthly bird surveys and 14 years of Jay Watch surveys since 2007. The four sites we monitored (Fig. 1) were not included in the Habitat Conservation Plan developed for jays in Indian River County.

Three areas included in Indian River County's Habitat Conservation Plan for Florida Scrub-Jay were surveyed by the county but not by Jay Watch. The sites are North Sebastian Conservation Area, Sebastian Scrub Conservation Area, and Wabasso Scrub Conservation Area. Additional Florida Scrub-Jay sightings are logged by county staff and volunteers from known jay habitat. We provide county Florida Scrub-Jay totals for 2020 in these areas for comparison (Fig. 1).

Florida Scrub-Jay nesting occurs from March through June (USFWS 1999). Juveniles have dull brown feathers and lack the blue heads and necklaces of adults. Known as brownheads, juveniles can be differentiated from adults from June through July when Jay Watch participants conduct surveys.

Survey stations are established in occupied Florida Scrub-Jay sites. The number of stations varied per site, but the survey protocols are consistent and make use of recorded vocalizations to elicit a territorial response from family groups. The vocalizations consist of Florida Scrub-Jay calls broadcast at one-minute intervals in all cardinal directions. Observers do not broadcast the jay calls if they detect predators in the area. Observers then record the direction from which Florida Scrub-Jays approach, the number of

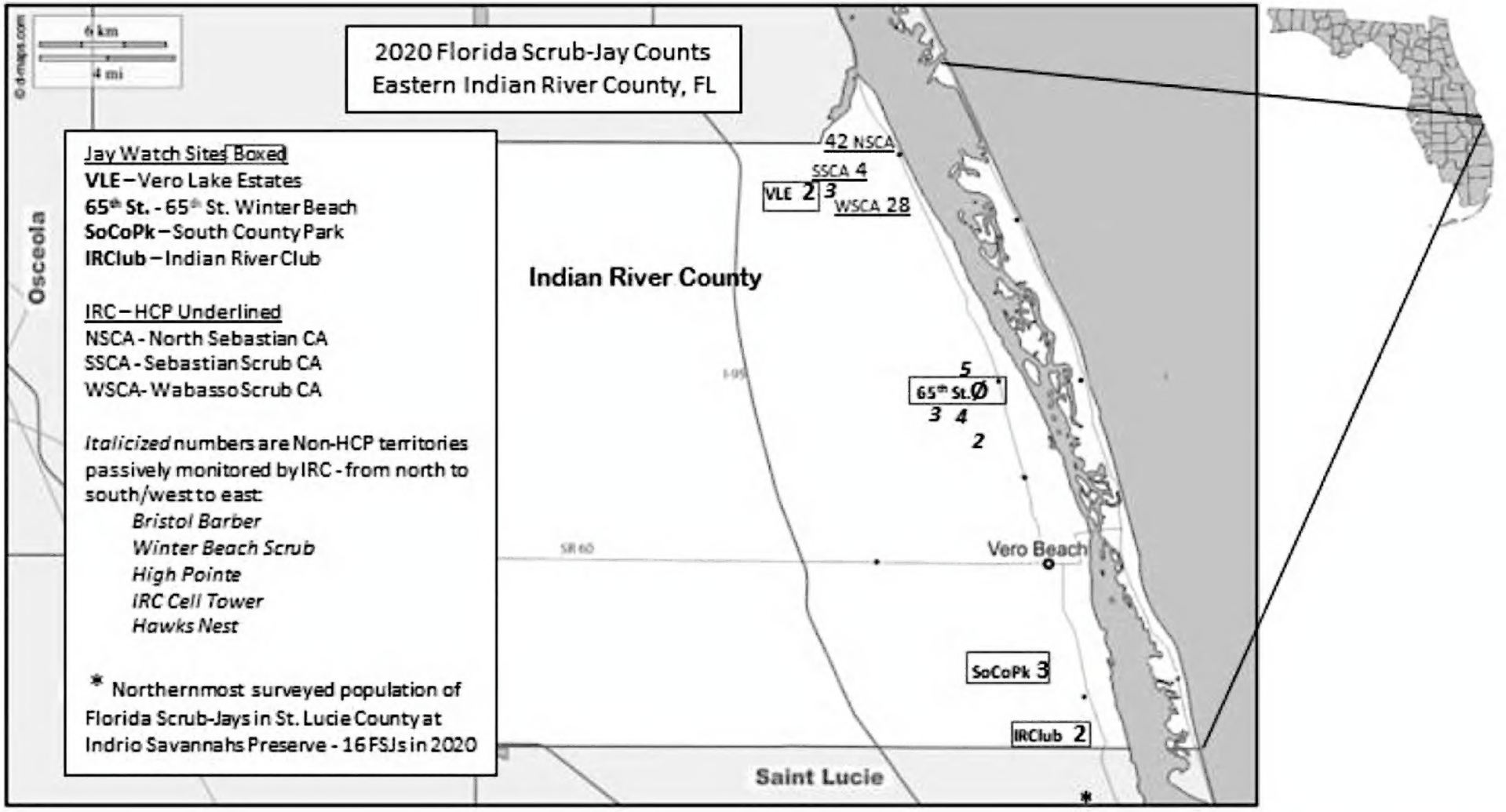

Figure 1. Locations of four sites where Florida Scrub-Jays were monitored by Jay Watch volunteers in Indian River County, Florida (IRC) and the number of jays at each site in 2020. The county monitors jays and manages habitat on three Conservation Areas (CA) east of I-95 through a federally approved Habitat Conservation Plan (HCP) for the jay.

juveniles seen, interactions of members of the family group, and interactions with neighboring family groups. Volunteers visit stations on three successive mornings. Three visits appear to detect all individuals and family groups present (Audubon Florida 2016). Observers submit counts to the administering agency at the end of the survey period along with field notes and maps showing locations of Florida Scrub-Jays encountered and scrub land cover. The United States Fish and Wildlife Service generates statewide summaries of Florida Scrub-Jay health at intervals.

Results

Vero Lake Estates.—Two family groups first observed in Jay Watch in 2015 decreased to a single family group and a lone jay to the south by 2016 (Table 1). The family groups were separated by an east-west canal and occupied approximately 6 ha. Volunteers counted only the single family group from 2017 through 2020; the male was banded in 2018 and the female was identified by hiccup calls (Woolfenden and Fitzpatrick 1984). This family group then occupied areas north and south of the canal, but volunteers did not observe juveniles.

65th Street.—The number of Florida Scrub-Jays observed along 65th Street was ≤3 from 2008–2013; in 2014–2017 volunteers did not observe jays. Two family groups appeared in 2018 that consisted of 2 and 3 adults. The family groups may have been displaced by development that took place north of the site. A male jay was banded onsite in 2018. Development to the north extended south to the survey site by 2020 and eliminated Florida Scrub-Jay habitat along 65th Street except for a narrow fringe. Volunteers did not count Florida Scrub-Jays on Jay Watch stations in 2020, although informal surveys by Indian River County found Florida Scrub-Jays both north and south of 65th Street (Fig. 1) in a patchwork of unmanaged scrub.

South County Park.—Florida Scrub-Jay records in this public park included a pair observed from 2007–2015. They did not fledge any young until 2016. The unbanded female was identified by a chronic feather condition around her right eye and the male, banded onsite in 2007, had only the silver federal band remaining by 2016. In 2017, we could not determine whether a wary Florida Scrub-Jay accompanying the longtime female was the banded adult male or the juvenile fledged in 2016. In 2018, volunteers observed four unbanded Florida Scrub-Jays, origins unknown, in addition to the two resident Florida Scrub-Jays. A male was banded after the 2018 survey and was recorded in 2019 with an unbanded female. This new pair fledged two juveniles that were banded by the county. This family group moved regularly between South County Park and an adjacent water treatment facility. Indian River County improved habitat conditions for jays in 2020 by removing tall pines and reducing the height of many of the scrub oaks. During the 2020 Jay Watch, observers found three adults: the adult

Table 1. Florida Scrub-Jay adult and juvenile Jay Watch counts from 2007 to 2020 in Indian River County. The number of families, if more than one, follows the number of individual adults and is in parentheses. A blank cell indicates that the site was not in the Jay Watch count that year.

		Florida Scrub-jay Adults & Juveniles in Indian River County Jay Watch Surveys from 2007-2020															
		Adults in Jay Watch surveys (# of families if >1 in parentheses)															
Site	ha (acre)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Mean	% of Years Observed Onsite
Vero Lake Estates - Private	6 (15)									4 (2)	3 (2)	2	2	2	2	2.5	100
65th St. Winter Beach - Private	3.5 (8.5)		2	3	2	1	2	2	0	0	0	0	5 (2)	4 (2)	0	1.6	62
South County Park - Public	4 (10)	2	2	2	2	2	2	2	2	2	2	2	6 (2)	2	3	2.4	100
Indian River Club - Private	6.5 (16)	5 (?)	7 (2)	5 (2)	5 (2)	4 (2)	4 (2)	3 (2)	2	2	2	2	0	3	2	3.3	93
TOTAL		7	11	10	9	7	8	7	4	8	7	6	13	11	7	8.1	
		Juveniles in Jay Watch surveys															
South County Park		0	0	0	0	0	0	0	0	0	1	0	0	2	0	0.2	14
Indian River Club		1	3	3	2	3	0	0	3	0	0	0	0	0	0	1.1	43

male banded in 2018, an unbanded female, and one of the banded juveniles from 2019.

Indian River Club.—Community bird counts first identified Florida Scrub-Jays onsite in the 1990s before the site was included in Jay Watch surveys starting in 2007. Observers identified two family groups in 2008 with three juveniles. The site continued to produce young through 2011 (Table 1) followed by a two-year period when observers did not record fledglings. A single pair observed in 2014 included a male banded onsite and an unbanded female. The pair produced three young that did not survive. The female was banded in 2016 and the two adults were present through the 2017 Jay Watch season, the last time the female was observed by volunteers. They observed the male for the last time in February of 2018. Observers did not count Florida Scrub-Jays in the 2018 Jay Watch. In 2019, they observed three adult unbanded Florida Scrub-Jays. The Jay Watch count for 2020 included two unbanded adults.

From 2016–2020, approximately 6.5 ha of scrub adjacent to the golf course was managed using funds provided by the property association as part of a regulatory agreement with the United States Fish and Wildlife Service. Management of Florida scrub involves roller chopping to reduce fuels followed by prescribed burns. The estimated cost for such management was $2,500 per hectare in 2021. Supplemental controlled burns are recommended every five to ten years with subsequent treatment costing less, based on a reduced fuel load (J. Hewett, pers. comm.). Since the 2019 count, Florida Scrub-Jays use the managed scrub and adjacent habitat. Environmental programs and field trips to the scrub are regularly offered by the Club.

Discussion

Indian River County has large tracts and remnant fragments of scrub vegetation along the sand ridge that extends east of I-95 for the length of the county. Increased pressure to develop these scrub patches coupled with degradation caused by fire suppression and subsequent succession to forested stands that Florida Scrub-Jays avoid have led to scrub becoming one of the most imperiled vegetation communities in the United States (USFWS 1999). Habitat degradation can be as much of an issue as habitat loss in conserving remaining Florida Scrub-Jay populations (Boughton and Bowman 2011).

Current conservation priorities for the Florida Scrub-Jay focus on large populations that have the greatest potential carrying capacity (Boughton and Bowman 2011). These populations may be easiest to sustain, but there could also be value in the small and oftentimes ephemeral sites monitored here. Isolation poses a threat to the genetic health of the largest extant populations remaining. Chen et al. (2016)

showed that the lack of dispersal among these large populations have both genetic and fitness consequences. They proposed that small outlying populations that have undergone genetic bottlenecks may play a crucial role in the genetic stability of population centers. Our study suggests that some of these small populations can persist for meaningful lengths of time, especially in cases such as the Indian River Club site monitored here where fragments engender support and curiosity from local citizens.

Ideally Florida Scrub-Jay territories should be surrounded by suitable habitat conducive to successful dispersal. Woolfenden and Fitzpatrick (1984) found that male dispersal generally falls within three territories (~1 km) of the natal territory, while female dispersal falls within five territories (~1.66 km). Dispersal is a necessary means of avoiding inbreeding (Woolfenden and Fitzpatrick 1984) and the reduction in genetic diversity it can promote (Chen et al. 2016). Florida Scrub-Jays living in fragmented habitats as opposed to those living in large tracts have been found to cover longer distances when dispersing (Breininger 1999). The population declines associated with fragmentation (USFWS 1999) may reflect the cost of dispersing to ever more distant habitat patches and a reduction in successful breeding (Coulon et al. 2010). The shift in these small families from those with non-breeding helpers to single breeding pairs may also affect breeding success (Breininger 1999).

Jay Watch records provide evidence of dispersal across the fragmented patches monitored in Indian River County. Four unmarked Florida Scrub-Jays were observed in South County Park a year before a new pair successfully bred there. Three Florida Scrub-Jays repopulated the restored area on Indian River Club where jays had once occurred. Both of these sites are on the south end of the county and both are managed. Although there is a healthy population of Florida Scrub-Jays within 8 km of South County Park and within 4 km of Indian River Club in St. Lucie County at the Indrio Savannahs Preserve (Fig. 1), Thaxton and Hingtgen (1996) found no evidence of dispersal from preserves to fragmented or suburban habitats. It is more likely that there are unidentified scrub fragments along the Florida ridge in the county that provided an undocumented source for these dispersals.

At first glance, these small Florida Scrub-Jay populations appear insignificant, with breeding low to non-existent. Threats to stability include continuous development, exotic vegetation, lack of scrub management and predators. However, a strict assessment of the small size of the populations may not reflect their ability to sustain individual family groups for several years while also promoting dispersal and genetic diversity. All four of the small fragments studied here were occupied more than 50% of the time monitored (Table 1). Continued

use of these fragments opens up many questions regarding seasonal movements, genetic consequences of fragmentation, the effect of the loss of helpers on the family, and survival of offspring. An additional threat to Florida Scrub-Jay populations surrounded by residential developments is the presence of domestic predators. Florida Scrub-Jays nest in trees at eye-level, and forage on the ground amid stunted vegetation. The biodiversity of scrub patches monitored through Jay Watch where domestic cats roam free is at risk. Personal observations of feral cats in three out of the four Jay Watch sites confirm their presence.

Monitoring is only possible through the continued effort of volunteers backed by non-profit organizations such as Audubon Florida. The community education provided by Jay Watch has increased environmental awareness in Indian River County. Analyzing 14 years of data from the Jay Watch program in Indian River County gives details about the sustainability of Florida Scrub-Jays and points to the lack of management as a death sentence for small populations. The benefits of preservation of scrub are well known, including but not limited to being home to Florida Scrub-Jays and many threatened and rare species of plants and animals. We support efforts to protect these environments with appropriate land and predator management. Effective management relies on the involvement of local property associations and local, state, and the federal government support of aggressive scrub management. Small family groups may provide benefits in terms of sustaining genetic diversity across the state's metapopulations while assisting in dispersal across broad areas. We believe that the maintenance of these fragmented habitats and their small populations is a worthwhile investment to the conservation of the species.

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INCOMPLETE CONSUMPTION OF SUCCESSFULLY CAUGHT PREY BY A SHORT-TAILED HAWK (*Buteo brachyurus*)

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Short-tailed hawks (*Buteo brachyurus*) are medium-sized buteos distributed throughout much of Central and South America from coastal Mexico to northern Argentina. Within the United States, there is a small and potentially genetically isolated population resident in peninsular Florida. Throughout their range, these raptors specialize on avian prey, with birds making up 97% of confirmed prey items (Ogden 1988). In general, predation success of avian prey is low (Toland 1986). The only detailed study of Short-tailed Hawk foraging found that, despite hunting most of the day, only 11% of capture attempts were successful, a rate of 1 capture for every 2.5 hours of hunting (Ogden 1974). Hunting success likely varies with numerous factors (Roalkvam 1985), including the motivation of the predator (Treleaven 1980), and defining all prey capture stoops as genuine prey capture attempts can lead to the false impression that aerial foraging raptors are inefficient hunters. Hunting on the wing might not be as energetically demanding as other types of foraging, and some aerial foragers may not always focus on achieving a high success rate and at times appear to be practicing or playing with their prey (Verbeek 1985). Nevertheless, observations of prey capture are rare.

One of these rare successful captures occurred shortly before 1350 on 17 July 2020, in a suburban neighborhood with numerous mature trees in Ft. Myers, Florida (26.6616976°N, –81.8448447°W). At 1345 while sitting indoors, one of us (KM) became aware of a sudden increase in the frequency and volume of Blue Jay (*Cyanocitta cristata*) vocalizations outside. Stepping outside, KM was quickly able to determine that a dark-morph Short-tailed Hawk had successfully captured a Blue Jay and was in the process of killing it while perched on a large branch of a mature live oak (*Quercus virginiana*; Durso and Morris 2020*a*). A group of 16 other Blue Jays was actively mobbing the hawk, causing it to move locations twice within 15 minutes. It flew first to a flamboyant (*Delonix regia*) approximately 30 m from its original perch, then to a second live oak 15 m from the flamboyant. About 30 minutes after the initial sighting of the hawk with its prey, a sudden bout of strong rainfall drove KM and the Blue Jays away from the scene.

At 1440 when the rain had settled to a light drizzle, we relocated the hawk in the same tree. Blue Jays remained in the vicinity at more-

or-less typical density for this location (2–5 Blue Jays almost always present) but did not resume mobbing after the rain. Upon observing that the Blue Jay carcass was no longer being held by the hawk, we searched the ground under the canopy for the carcass. We found the carcass plucked and with the head removed, but otherwise mostly intact, already being fed upon by carrion-eating insects. We did not observe the Short-tailed Hawk again that afternoon or evening, although the tree canopy is dense enough that it could have remained in the tree overnight. Presumably we observed the same Short-tailed Hawk at 1030 the following morning perched in the same oak tree, again being vigorously mobbed by approximately 12 Blue Jays (Durso and Morris 2020*b*). The Blue Jay carcass was gone, but whether the hawk recovered it or a scavenger took it over night is unknown. After a few moments, the hawk took flight, soaring briefly and heading south. We have subsequently observed Short-tailed Hawks flying over this location a little less than once per month between June 2020 and May 2021 (~150 person-hours of birding effort distributed more-or-less evenly throughout that year).

Short-tailed Hawks are known to consume a wide range of small to medium-sized birds, and rodents, snakes, and lizards. Bird species consumed include Eastern Meadowlark (*Sturnella magna*), Red-winged Blackbird (*Agelaius phoeniceus*), Northern Bobwhite (*Colinus virginianus*), Mourning Dove (*Zenaida macroura*), Common Ground-Dove (*Columbina passerina*), Yellow-billed Cuckoo (*Coccyzus americanus*), Northern Flicker (*Colaptes auratus*), Tufted Titmouse (*Baeolophus bicolor*), Blue-gray Gnatcatcher (*Polioptila caerulea*), Northern Cardinal (*Cardinalis cardinalis*), Dickcissel (*Spiza americana*), Eastern Towhee (*Pipilo erythrophthalmus*), vireos, warblers, sparrows, and smaller raptors including American Kestrel (*Falco sparverius*) and Sharp-shinned Hawk (*Accipiter striatus*; Coues 1874; Cottam and Knappen 1939; Ogden 1974, 1988; Brown 1986). In Florida, they have also been observed hunting White-winged Dove (*Zenaida asiatica*), Eurasian Collared-Dove (*Streptopelia decaocto*), Killdeer (*Charadrius vociferus*), Tree Swallow (*Tachycineta bicolor*), American Robin (*Turdus migratorius*), Cedar Waxwing (*Bombycilla cedrorum*), American Goldfinch (*Spinus tristis*), and parrots (Ogden 1974, Robertson and Woolfenden 1992). Blue Jays have been identified as potential prey items and seem to be of a suitable size, but to the best of our knowledge this observation is the first report of a Blue Jay as prey of a Short-tailed Hawk. The ranges of the two species overlap only in peninsular Florida.

Mobbing of raptors is common in passerines, and raptors that prey on birds are more heavily mobbed than other birds of prey (Dutour et al. 2016), especially during the breeding season (Dutour

et al. 2019), evidently to deter nest predators and so that young birds can learn to identify predators and employ predator-specific defense strategies. Another proposed function of mobbing is to discourage predatory birds from remaining in an area to reduce future predation risk (Consla and Mumme 2012). Mobbing often continues even after the immediate threat has passed, and the presence of a dead conspecific in a predator's talons increased investigatory behavior and did not decrease the intensity of mobbing in a controlled experiment (Carlson et al. 2017). Corvids in particular gain information from observing dead conspecifics (Iglesias et al. 2012, Swift and Marzluff 2015). Known predators of adult Blue Jays include accipiters, owls, falcons, and Broad-winged (*B. platypterus*) and Red-tailed Hawks (*B. jamaicensis*; Smith et al. 2020).

Adult Short-tailed Hawks sometimes consume the heads of prey before bringing the rest to their nestlings (Miller and Meyer 2020), although this was probably not the case in our observation because the breeding season in Florida is thought to end in May. The rainstorm might have caused the hawk to drop the prey after consuming the head, and the mobbing or our presence might have played a role in delaying or preventing the hawk from recovering its prey. More detailed observations are necessary to determine the influence of weather, mobbing behavior, and other factors (e.g., energetics) on predator success and prey abandonment.

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ADDITIONAL RECORDS OF ECTOSYMBIONTS FROM THE OVENBIRD (*Seiurus aurocapilla*) ON VACA KEY, FLORIDA

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Birds are perhaps the best studied group of animals, yet the community of symbiotic organisms associated with birds is still relatively poorly studied (Bush et al. 2016). I previously reported unidentified feather mites, *Amerodectes* sp. and *Proctophyllodes* sp. (Proctophyllodidae), from an Ovenbird (*Seiurus aurocapilla*), on Vaca Key, Florida (Hribar 2013). On 14 September 2021 another ovenbird was found dead at the same location as the previous specimen. I processed the carcass and prepared ectofauna for study as described earlier (Hribar and Miller 2011).

I recovered 10 mites and 1 louse and sent the specimens to specialists for identification (see ACKNOWLEDGMENTS). Three species of feather mites were identified: 2 males, 1 female, and 1 tritonymph of *Proctophyllodes breviquadratus* Atyeo and Braasch, 1966 (Proctophyllodidae: Proctophyllodinae); 1 male, 2 females, and 2 tritonymphs of *Amerodectes seiurus* Mironov and Chandler, 2017 (Proctophyllodidae: Pterodectinae); and 1 male of *Trouessartia seiurus* Mironov and Chandler, 2020 (Trouessartiidae). The louse was unidentifiable because of damage to the specimen and loss of structures necessary for identification. There is no mention of a louse recovered from Ovenbirds in Florida in the exhaustive review by Forrester and Spalding (2003). However, *Menacanthus aurocapillus* Carriker (Phthiraptera: Menoponidae) is known from Ovenbirds in Maryland (Carriker 1958) and Newfoundland, Canada (Threlfall and Wheeler 1986). Unidentified species of *Brueelia* (Phthiraptera: Philopteridae) and *Myrsidea* (Phthiraptera: Menoponidae) were collected from Ovenbirds in Illinois by Bueter et al. (2009).

Of the three mites species collected, *A. seiurus* and *T. seiurus* are recently described species; *T. seiurus* was previously known only from the Ovenbird in Georgia (Mironov and Chandler 2020), whereas *A. seiurus* is known from Arkansas, Georgia, Missouri, and Tennessee from the Ovenbird and also from another parulid, the Kentucky Warbler (*Geothlypis formosa*; Mironov and Chandler 2017, Matthews et al. 2018). The host associations of *P. breviquadratus* are more

intriguing. This species was found on Ovenbirds (Atyeo and Braasch 1966, Atyeo and Winchell 1984), but it is also reported from seven other parulid species, and one species each in Regulidae and Vireonidae (Atyeo and Braasch 1966). Feather mites often present a complicated set of evolutionary and ecological conundrums. Morphologically almost indistinguishable by routine identification techniques (light optics) but genetically different mites inhabiting different host species are treated as a morphologically identical mite species inhabiting multiple host species (Doña et al. 2019). Matthews et al. (2018) conducted a genetic study of feather mites inhabiting 14 parulid species and found mites that were identified genetically as *Proctophyllodes quadratus* Atyeo and Braasch but conformed morphologically to *P. breviquadratus*. Until more molecular study of *P. breviquadratus* populations from different hosts is done, it should be considered to be one species that exploits a number of host species.

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BIRD ABUNDANCE AND DIVERSITY IN MOSQUITO LAGOON, FLORIDA, USA

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Abstract.—Mosquito Lagoon, the northernmost portion of the Indian River Lagoon along the eastern coast of Florida, is home to a variety of both resident and migratory bird species, including over a dozen categorized as either threatened or endangered in the state of Florida. Though birds have previously been monitored in parts of the central and southern Indian River Lagoon system, there has been little research on birds in Mosquito Lagoon. In this study, we used 2 years of survey data to evaluate the abundance and diversity of the avian community in Mosquito Lagoon. We made 22,085 bird observations, including 67 species. We documented the highest abundance and species richness in the winter. We evaluated the use of habitat features (e.g., oyster reefs, sandbars, mangroves, artificial structures) by species and found 16 associated with single habitat features, and an additional 20 associated with a combination of two habitat features. These results provide baseline information on the bird community in Mosquito Lagoon to better assess the impacts of future environmental changes.

Key words: bird community, estuary, habitat use, Mosquito Lagoon

Coastal ecosystems, including mangroves, seagrass beds, and oyster reefs, are affected by anthropogenic factors and climate change (Field 1995, Beck et al. 2011, Polidoro et al. 2010, Bindoff et al. 2019). Species that rely on coastal ecosystems will likely be negatively affected by habitat alteration and loss. As these ecosystems continue to change, it is important to have baseline data on vulnerable species and ecologically and economically valuable taxa to assess the impacts of changes over time. Many coastal birds are experiencing population declines (Brown et al. 2001, Kushlan et al. 2002). These birds serve ecological functions and provide a myriad of ecosystem services

(Wootton 1991, Sekercioglu 2006, Tabur and Ayvaz 2015, Whelan et al. 2015), highlighting the importance of conserving these at-risk taxa.

In dynamic coastal ecosystems, it is important to monitor biodiversity to detect species declines, assess impacts of environmental changes, and evaluate the effectiveness of restoration and management practices (Lindenmayer et al. 2012, Pocock et al. 2015, Baumgardt et al. 2019). Complete inventory and monitoring is often impractical, but previous studies indicate that birds may be useful indicators of long-term environmental trends and are acceptable proxies for biodiversity in ecosystems with heterogeneous landscapes (Temple and Wiens 1989, Gregory et al. 2003, Gregory and Strein 2010, Eglington et al. 2012).

The Indian River Lagoon (IRL) system is widely considered one of the most biodiverse estuaries in North America (Provancha et al. 1992, Gilmore 1995, Schmalzer 1995, Lang and Hines 2005). The avian fauna within the IRL includes a variety of both resident and migratory birds (IRLNEP 2019). More than a dozen of the birds commonly found within the IRL are listed by the state of Florida as threatened species (FFWCC 2018).

Birds are of ecological and economic importance in the region, yet little research has been conducted regarding the bird community composition and habitat feature use in the northern portion of Mosquito Lagoon. Some previous studies have focused only on southern areas of Mosquito Lagoon and surveyed only specific bird groups (wading birds or shorebirds) rather than surveying all birds (Breininger and Smith 1990, Schikorr and Swain 1995, Smith and Breininger 1995, Epstein 2019). Shaffer et al. (2019) surveyed all bird types in Mosquito Lagoon but only in reference to their use of oyster reefs, so did not include bird use of other habitat features. Similarly, Rifenberg et al. (2021) made observations of vertebrates, including birds, but their study was limited to a recently restored living shoreline site in southern Mosquito Lagoon. The goals of this study were to assess the seasonal bird abundance and diversity in Mosquito Lagoon and evaluate the use of various habitat features in the region by specific bird taxa.

Methods

Study site.—The Indian River Lagoon is located along the eastern coast of central Florida, stretching 251 km from Ponce Inlet in Volusia County to Jupiter Inlet in Palm Beach County and is composed of three interconnected regions: Mosquito Lagoon, the Banana River, and the Indian River. This region lies in a transition zone between a temperate climate zone to the north, and a subtropical climate zone to the south (Gilmore 1995, Schmalzer 1995, Lang and Hines 2005). The IRL contains a mosaic of ecosystems, which contribute to its biodiversity, including seagrass beds, mangrove forests, soft non-vegetated bottom, salt marsh, and oyster reefs. Mosquito Lagoon is the northernmost portion of the IRL system; thus, its biota includes more temperate species and fewer subtropical species than are found in the more southern portions of the system (Provan-

cha et al. 1992). The salinity in Mosquito Lagoon ranges from 22.6–45.2 ppt annually, and the average depth of the lagoon is 1.5 m (Walters et al. 2001, Phlips et al. 2015). The lagoon is microtidal, with the principal lunar semi-diurnal (M_2) tidal amplitudes between 1 cm and 1 m, ranging between 13 cm and 15 cm in central Mosquito Lagoon (Smith 1993, Steward et al. 2006; P. E. Sacks, University of Central Florida, pers. obs.). Water levels vary based on season, with highest water levels occurring annually in the fall (Smith 1993).

For 2018–2020, the mean air temperature at the time of sampling (± 95% CI) was 26.6 ± 1.6 °C, mean wind speed was 6.1 ± 1.0 km/hour, and no freeze events occurred during the two-year study period (Weather Underground 2020). Hurricane Dorian occurred in the Atlantic Ocean from 28 August to 6 September 2019. While it did not make landfall in Florida, it did impact some areas along the East coast of Florida, causing a period of increased water levels throughout September and October of 2019 (Ezer 2020).

To elucidate the bird diversity and bird use of habitat features in Mosquito Lagoon, we surveyed all birds including, but not limited to, wading birds, shorebirds, seabirds, songbirds, and waterfowl, along a 14.5-km transect through the northern portion of Mosquito Lagoon spanning from the cities of Oak Hill in the south to Edgewater in the north. We selected the route to serve as a representative sample of the heterogeneity of habitat features within Mosquito Lagoon. The transect route included intertidal oyster reefs, sandbars, artificial structures such as signs and pilings, open water, and mangrove fringe throughout its length. In Mosquito Lagoon, as in other regions, there has been a recent shift from salt marsh-dominated to mangrove-dominated communities (Cavanaugh et al. 2019). As such, our route did not include any areas that were solely made up of low marsh plants. Previous research indicates that coastal birds use oyster reefs, sandbars, open water, and mangroves as loafing and foraging habitat (Isola et al. 2000, Alfaro and Clara 2007, Herbert et al. 2018, De Dios Arcos et al. 2020) and use artificial structures for perching or nesting (Bosler 2011, Mainwaring 2015). We used binoculars to spot birds, photographed all birds seen along the transect, and evaluated the abundance and diversity of avian populations in this region. Our study spanned two years and we analyzed seasonal variations in the bird community. Because this estuary contains a mosaic of ecosystems, we also assessed the use of habitat features (e.g., oyster reefs, mangrove fringes, sandbars, artificial structures) by species.

Sampling methods.—We sampled seasonally from December of 2018 through November of 2020: winter (December–February; n = 13), spring (March–May; n = 8), summer (June–August; n = 13), and fall (September–November; n = 18). Differences in the number of transects per season were due to logistical constraints such as weather and research restrictions due to the COVID-19 pandemic. We selected a 14.5-km transect route (Fig. 1) that included boat-accessible areas in the northern portion of Mosquito Lagoon. The route included tidal channels bordered by mangroves, mangrove islands, oyster reefs, dead oyster reef margins, sand bars, and anthropogenic features such as dredged channels, pilings, and aquaculture leases. We followed the transect route in a 20-foot pontoon boat moving slow enough to create no wake (5–15 km/hr) and used binoculars to spot (but not identify or count) birds. To confirm bird species, we took photographs of all observed birds with a handheld Nikon D7500 digital 35-mm camera with a AF-S Nikkor 200–500-mm lens (Nikon, Melville, NY, USA). We photographed birds observed along the route within 50 m on either side of the boat. We used aerial maps to determine the route boundaries and photographed only birds seen within those boundaries. We photographed birds seen only while looking ahead of the boat or to the right or left of the boat and did not photograph birds behind the boat. The total area of the transect was approximately 150 ha. We were aware of previous studies indicating a bias toward observing white birds in surveys due to their conspicuousness against the landscape (Schikorr and Swain 1995). To minimize this bias, two to three trained observers were present during each transect and we used binoculars to scan the landscape on both sides of the boat and

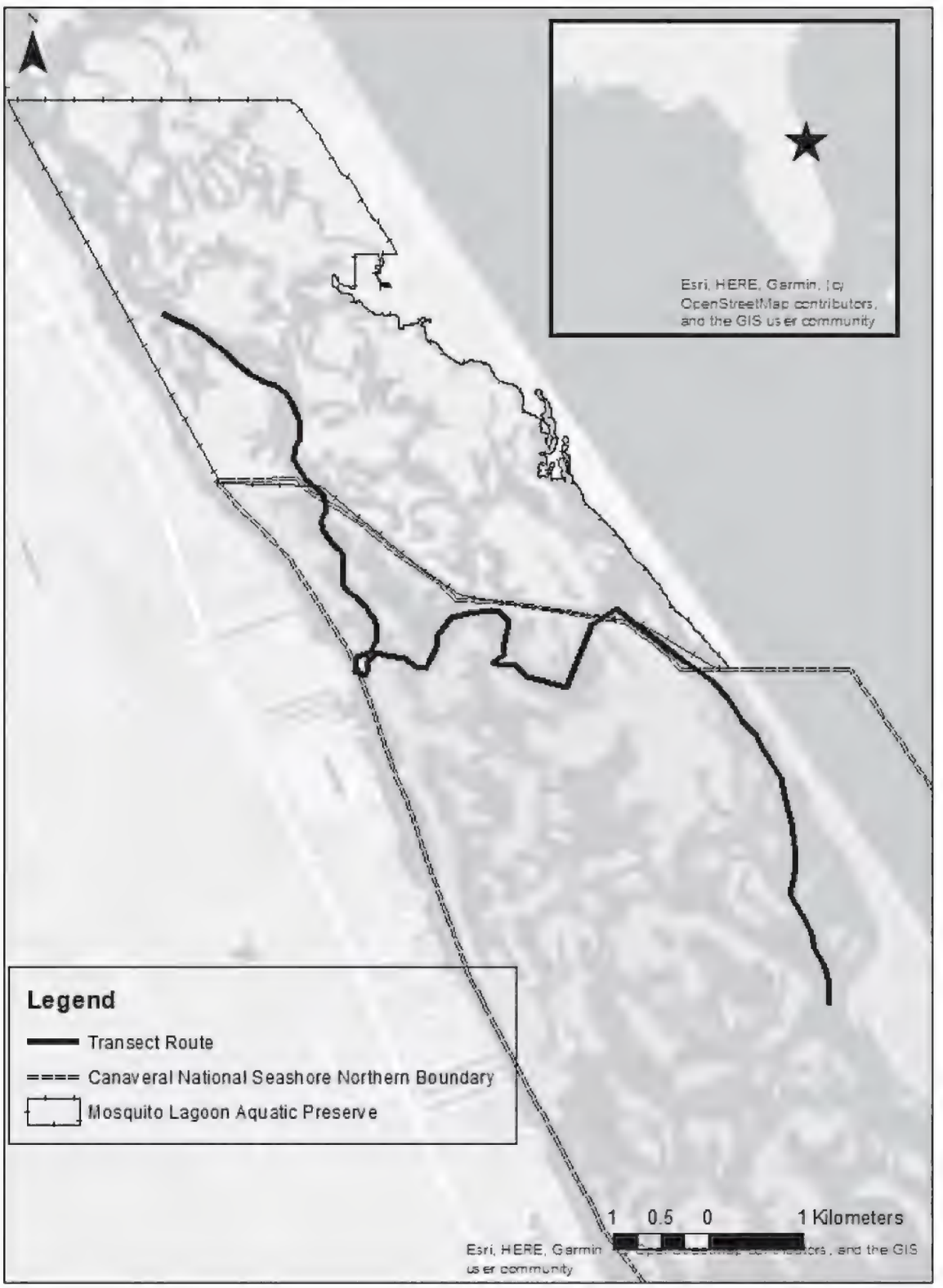
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Figure 1. The photograph transect route (bold) where we surveyed for birds in Mosquito Lagoon, Florida, 2018–2020, with boundaries of Canaveral National Seashore (CANA) and Mosquito Lagoon Aquatic Preserve (MLAP). The Intracoastal Waterway runs along the western border of both CANA and MLAP. We haphazardly determined whether the transect was started at the north or south end of the route for each sampling event.

ahead of the boat. Even so, it is likely that we missed some birds (e.g., birds with cryptic colorations and some birds in large flocks). Therefore, our estimates of bird abundance and diversity are conservative. Transect surveys took approximately 1 hour to complete and we chose the direction of the transect (north or south) haphazardly prior to each trip.

We identified each bird in the photographs to species level. If a bird was loafing or foraging, we sorted photographs based on habitat feature: live intertidal oyster reef (natural [5.12 ha] or restored [1.09 ha]), dead oyster reef (0.38 ha), live mangroves and mangrove shorelines (23.23 km), dead tree branches [any species], artificial structures, sandbar). If birds were not loafing or foraging, we sorted based on behavior (flying, floating, wading). We separated live and dead oyster reefs because previous studies suggest that birds in Mosquito Lagoon tend to use live oyster reefs more often for foraging and use dead oyster reefs more often for loafing (Shaffer et al. 2019, Copertino et al. 2022). The live oyster reef category included birds observed on or within 1 m of natural or restored oyster (*Crassostrea virginica*) reefs, and the dead oyster reef category included birds observed on or within 1 m of dead oyster reefs. Dead oyster reefs consist of piles of loose, disarticulated shells that sometimes reach elevations as high as 1 m above the high tide line (Grizzle et al. 2002). In the mangrove category, we included birds observed perched on live mangrove branches or wading within 1 m of mangrove shorelines. The three species of mangroves found in this area are red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and white mangrove (*Laguncularia racemosa*). Some mangrove shorelines also contained smooth cordgrass (*Spartina alterniflora*), but it was not the dominant feature. Hence, we referred to these areas as mangrove shorelines. There were no areas along the transect that were dominated by smooth cordgrass and other low marsh plants. The dead tree branch category included birds perched on branches of standing dead trees, including but not limited to mangroves, pine trees, and palm trees. In the artificial structure category, we included birds found on any man-made (or human-placed) structures including signposts made of polyvinyl chloride (PVC) or wood, metal signs (n = 42), PVC pilings (n = 80), docks (floating and fixed, n = 24), wooden and metal utility poles (n = 33), riprap, and aquaculture equipment (0.21 ha) for oyster growing (placed in Mosquito Lagoon on transect route in late 2018). The sandbar category included birds on sandbars that were fully or partially exposed. In the floating and wading behavior categories, we included birds that were floating or wading in open water but not within 1 m of either oyster reefs or mangrove shorelines. We used aerial imagery from Google Earth Pro (version 7.3.3.7786, Google, Mountain View, CA, USA) to estimate the areas of oyster reefs, sandbars, and aquaculture equipment within the transect area, and counted the numbers of artificial structures such as sign posts, pilings, and docks. A small number of birds in the photographs could not be identified to species level because of image darkness, distance, or camera angles. In these instances, we categorized the birds as unidentified.

We used Weather Underground (2020) to determine the temperature and mean wind speed at the time of each transect. We did not complete surveys if wind speed exceeded 24 km/hour or if it was raining. We selected survey times haphazardly. We conducted transect surveys at various times of the day and surveys included various tidal periods. Because of seasonal differences in water levels, we categorized the water level for each transect regardless of tidal period as either high (no oyster reefs or sandbars exposed), medium (oyster reefs and sandbars partially exposed), or low (oyster reef and sandbars completely exposed). High water levels may be caused by either high water season or by high tide during low water seasons.

Statistical methods.—We first generated a rarefaction curve to assess the likelihood that our sampling efforts captured the representative species richness of the study region (Hsieh et al. 2019). For each species, we calculated the observation percentage by dividing the number of bird observations of each species encountered on

all transects by the total number of bird observations on all transects. We repeated this calculation to determine the observation percentage of each species for each habitat feature. Next, we calculated the percent occurrence for each species by dividing the number of transects in which the species occurred divided by the total number of transects performed. We completed this calculation for total number of birds observed in each transect and broken down by habitat feature. The abundance data were highly dispersed count data, so we used negative binomial generalized linear models and Akaike's information criterion (AIC) model selection to determine which factors influenced the total number of birds observed. The response variable in all of our models was the total number of birds (regardless of species) observed. The predictors that we included in our models were season, average wind speed, and wind gust speed. We did not include temperature or water level in the models because they are correlated to season. We calculated seasonal abundance (total number of birds) and species richness (number of different species) for the region (Oksanen et al. 2019) and used analysis of variance (ANOVA) and Tukey's honestly significant difference (HSD) *post hoc* tests to determine any seasonal differences in these indices.

To assess the differences in community assemblages based on habitat feature and behavior, we generated ordination plots using non-metric multidimensional scaling (NMDS) with Bray-Curtis dissimilarity. The NMDS method is an ordination technique that reduces complex multi-dimensional data to a plot with fewer dimensions, making it easier to visualize differences between groups. It is based on an iterative process, which results in a plot with the lowest stress. Stress represents the difference between the distances on the two-dimensional plot and the distances in complete multidimensional space; stress values <0.2 are considered an acceptable fit for ecological data (Clarke 1993, McCune and Grace 2002). The data used in this analysis were the total abundances of each species observed for each habitat feature or behavior combined by season. We summed the bird observations from the individual survey data for each season to reduce the number of zeros and to reduce stress. We conducted permutational multivariate analysis of variance (PERMANOVA) tests to determine if there were community differences based on habitat feature or behavior (Oksanen et al. 2019). We summed the bird observations from the individual transect data for each season to use in this analysis to reduce the number of zeros and to reduce stress in the ordination plot. We used multi-level pattern analysis, which assesses the strength of the relationships between species abundance or occurrence with specific sites or groups of sites, to generate lists of representative species associated with specific habitat features (De Cáceres and Legendre 2009). This analysis determines an indicator value for each species for each habitat feature based on two statistics. Statistic A is the positive predictive value of the species and represents an estimate of the probability that a site belongs to a particular habitat feature based on the presence of the species. Statistic B is the fidelity value of the species and represents an estimate of the probability of finding the species at that particular habitat feature. Flying birds were included only in the overall abundance analyses and we did not include those birds in this analysis. We used R (version 3.6.2) and Rstudio (version 3.6.2) for all statistical analyses (RStudio Team 2019, R Core Team 2020).

Results

Abundance and diversity.—We identified 67 species and made 22,085 bird observations. The mean number of bird observations per survey was 397.6, or 2.7 birds/ha. Two hundred ninety-two birds (1.3% of total birds) were unidentifiable to species level because of dark photographs, distance, or camera angle. The rarefaction curve reached an asymptote,

indicating that our sampling efforts provided a representative sample of the species richness of the study region (Fig. 2).

Results of AIC model selection (Table 1) determined that the model that best predicted bird abundance included only season as a predictor. Abundance (± 95% CI) was higher in winter (1,013.0 ± 594.3) than in all other seasons ($P < 0.001$ for all; Fig. 3A). Similarly, species richness (Fig. 3B) was higher in winter (25.8 ± 2) than all other seasons ($P \leq 0.001$ for all).

The five most numerically abundant bird families observed were Laridae (gulls and terns, n = 5,957, 27.0%), Anatidae (ducks, n = 4,911, 22.2%), Ardeidae (herons and egrets, n = 3,013, 13.6%), Scolopacidae (sandpipers, n = 2,023, 9.2%), and Threskiornithidae (ibises, n = 1,012, 4.6%). These families accounted for 76.6% of all birds observed (n = 16,918). Twenty additional families comprised the remaining 23.3% (n = 5,167). Laridae, Ardeidae, and Threskiornithidae were present in 100% of the transects throughout all seasons. Although Anatidae were the second most abundant family, they were only present in 60.0% of transects, with none present in summer 2019; Scolopacidae were present in 67.3% of transects. In the spring of 2020, we observed a lone Surf Scoter (*Melanitta perspicillata*) floating in open water, and in the summer of 2020 there were

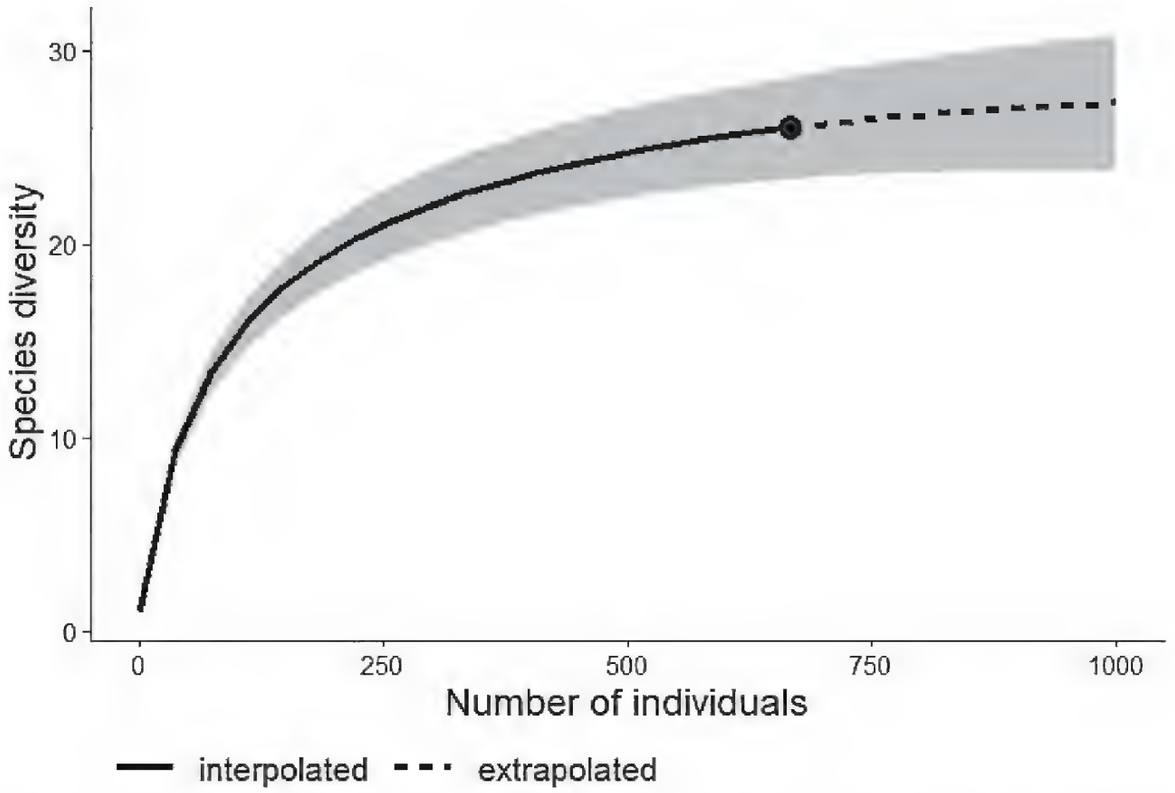

Figure 2. Rarefaction curve to determine whether our sampling efforts were effective at capturing an accurate representation of the bird species diversity of the region in Mosquito Lagoon, Florida, 2018–2020. If the curve reaches an asymptote, our sampling efforts were effective.

Table 1. Model selection table for negative binomial generalized linear models predicting total bird abundance in Mosquito Lagoon, Florida, 2018–2020. We present corrected Akaike's information criterion (AIC_c), difference in AIC_c (ΔAIC_c), degrees of freedom (df), and AIC_c weight.

Model	AIC_c	ΔAIC_c	df	AIC_c weight
Season	727.1	0.0	5	0.41
Season + wind gust	727.8	0.8	6	0.28
Season + average wind	728.9	1.8	6	0.16
Season + average wind + wind gust	729.0	2.0	7	0.15
Null model	773.8	46.7	2	<0.001
Average wind speed	776.0	49.0	3	<0.001
Wind gust speed	776.0	49.0	3	<0.001
Average wind + wind gust	778.4	51.3	4	<0.001

10 observations of Mottled Ducks (*Anas fulvigula*), which are endemic to Florida and were the only non-migratory waterfowl species observed in this study.

Associated habitat features or behavior.—We identified bird assemblages (groups of species) using each habitat feature per season (P = 0.001). The ordination plot results suggested that the bird assemblages observed perched on dead treetops differed from those found on sandbars, wading in shallow water, on dead oyster reefs, floating in open water, and on mangroves or mangrove shorelines (Fig. 4). The plot indicated similarities between bird assemblages on live oyster reefs and on artificial structures. Additionally, bird assemblages observed floating in open water differed from those associated with live oyster reefs and mangroves, had some similarity with birds associated with sandbars and wading in shallow water, and even more similarity with birds on artificial structures and dead oyster reefs. The plot indicated similarities in the bird assemblages associated with wading in shallow water mangroves and live oyster reefs (Fig. 4). There was little to no similarity between the assemblages associated with sandbars and those associated with floating in open water, artificial structures, mangroves, or dead treetops. The assemblages of birds on oyster reefs and shallow wading suggested that those assemblages were also similar (Fig. 4; Appendix 1).

There were 35 representative species associated with various habitat features or behaviors, including combinations (Table 2). Of these, 14 species were associated with one habitat feature or behavior. Two of the top four species associated with live oyster reefs were Reddish Egret (*Egretta rufescens*) and Black Skimmer (*Rynchops niger*), both of which are listed as threatened on the Florida Fish And Wildlife Conservation Commission Imperiled Species List (FFWCC 2018). The single species associated with dead oyster reefs was Least

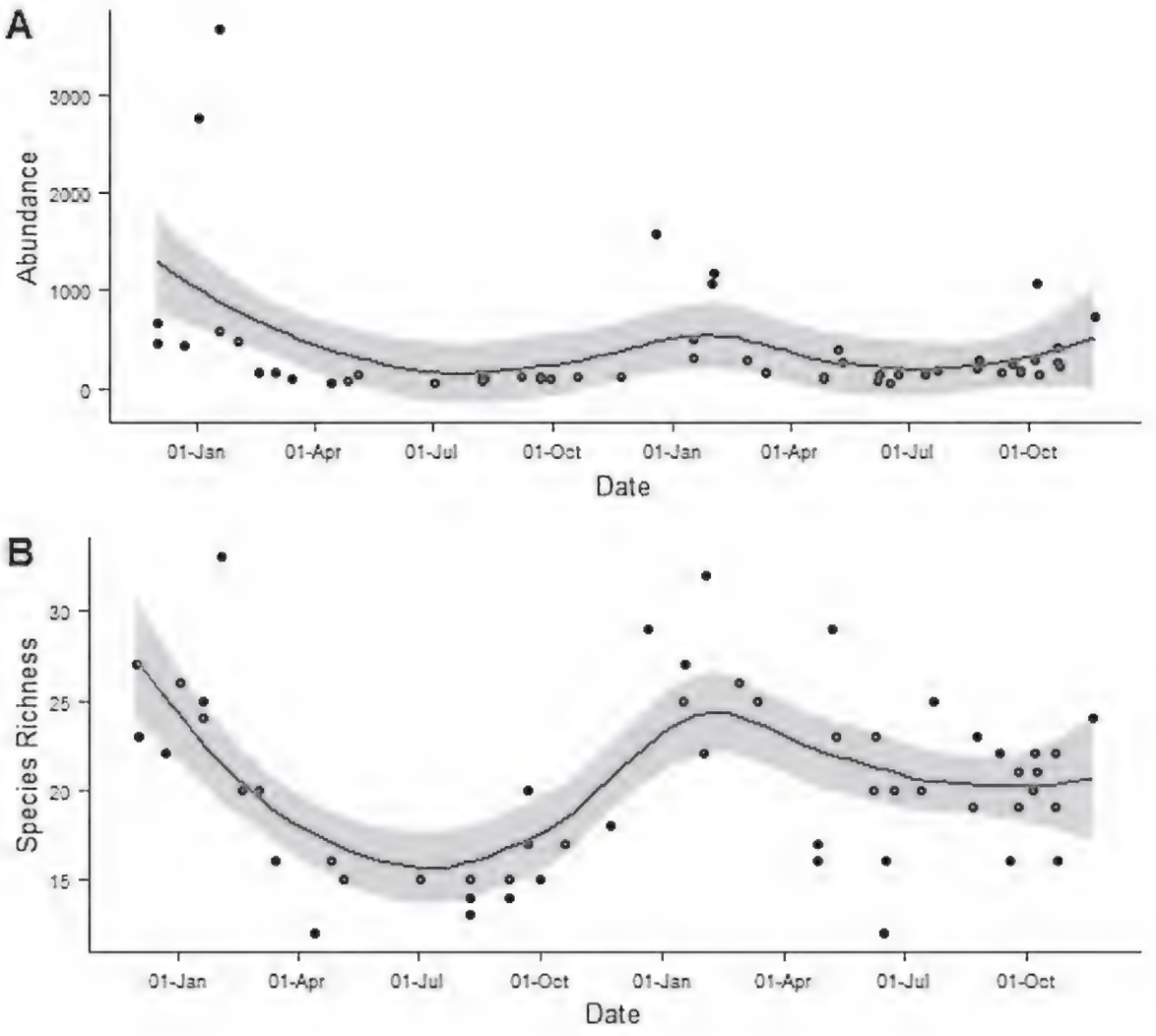

Figure 3. Abundance (A) and species richness (B) of birds in Mosquito Lagoon, Florida, 2018–2020. We present trend lines (dark gray lines) and 95% confidence intervals (light gray shading).

Tern (*Sternula antillarum*), which is also a threatened species in the state of Florida and nests on dead reefs. There were an additional 21 species that were representative of a combination of two habitats or behaviors. Species that were most closely associated with oyster reefs plus mangroves included wading birds, such as White Ibis (*Eudocimus albus*) and several species of herons and egrets. Raptors, specifically Osprey (*Pandion haliaetus*) and Turkey Vulture (*Cathartes aura*), were associated with both dead treetops and artificial structures.

DISCUSSION

We found a higher density of birds than was previously reported because the previous studies only reported densities of nesting birds or wading birds. Our observed mean density of all birds was 2.7 birds/ha for our route within the northern Mosquito Lagoon. Birds are both ecologically and economically important members of the

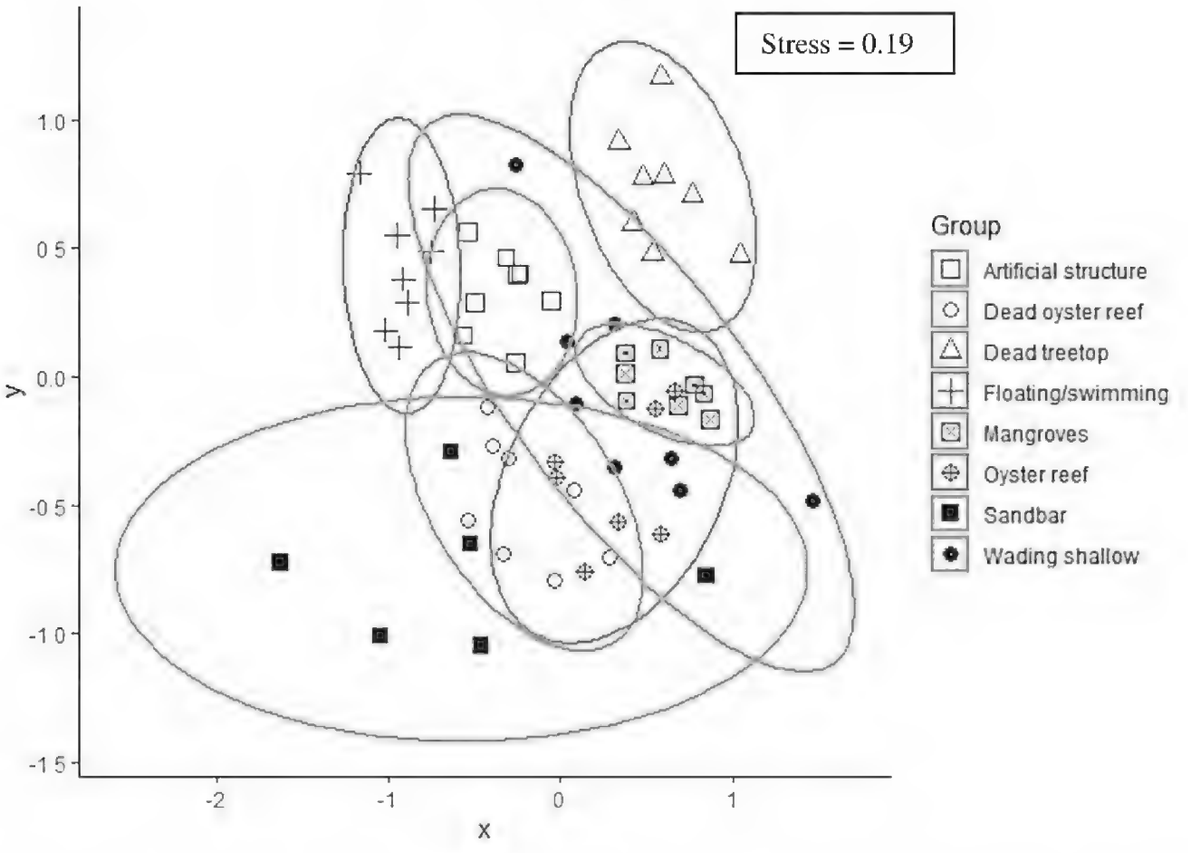

Figure 4. Non-metric multidimensional scaling (NMDS) ordination plot of species assemblages for different habitat features used by birds in Mosquito Lagoon, Florida, 2018–2020. Different symbols represent bird assemblages during a particular season for each specific habitat feature. Ellipses represent 95% confidence intervals for habitat feature groupings.

Mosquito Lagoon community, underlining the need for monitoring and assessment of avian taxa within the region. Previous studies in the nearby Kennedy Space Center and Merritt Island National Wildlife Refuge focused on nesting bird densities or only reported bird densities for wading birds. Our observed mean wading bird density was 0.48 birds/ha, which was within the range of wading bird densities observed in previous studies in more southern portions of the Indian River Lagoon that indicated 0.26–0.90 birds/ha (Trost 1968, Smith and Breininger 1995, Stolen 2006).

Recent studies in the northern portion of Mosquito Lagoon focused on bird use of oyster reefs and a restored shoreline. Shaffer et al. (2019) identified 41 species in their surveys of bird use of oyster reefs, 38 of which were also observed in our study. They observed Killdeer (*Charadrius vociferus*), Sanderling (*Calidris alba*), and Wilson's Plover (*Charadrius wilsona*), which were not observed in our study. Similarly, Rifenberg et al. (2021) identified 16 bird species on a restored shoreline in Mosquito Lagoon approximately 5 km south of our study area, 14 of which were also observed in our study. They observed Western Sandpiper (*Calidris*

Table 2. Representative species by habitat features for bird surveys in Mosquito Lagoon, Florida, 2018–2020. The indicator value is based on statistics A and B. Statistic A is the positive predictive value of the species and represents an estimate of the probability that a site belongs to a particular habitat feature based on the presence of the species. Statistic B is the fidelity value of the species and represents an estimate of the probability of finding the species at that particular habitat feature. All values are statistically significant at the $P < 0.05$ level.

Species	Indicator Value	A	B
Live oyster reefs			
Willet (*Tringa semipalmata*)	0.62	0.60	0.64
Reddish Egret (*Egretta rufescens*)	0.30	0.82	0.11
Black Skimmer (*Rynchops niger*)	0.28	0.93	0.08
Spotted Sandpiper (*Actitis macularius*)	0.25	0.74	0.08
Dead oyster reefs			
Least Tern (*Sternula antillarum*)	0.35	0.99	0.12
Mangroves and mangrove shorelines			
Anhinga (*Anhinga anhinga*)	0.52	0.68	0.39
Black-crowned Night Heron (*Nycticorax nycticorax*)	0.46	0.88	0.24
Dead treetops			
Turkey Vulture (*Cathartes aura*)	0.36	0.66	0.19
Gray Kingbird (*Tyrannus dominicensis*)	0.34	1.00	0.12
Sandbars			
Caspian Tern (*Hydroprogne caspia*)	0.54	0.72	0.41
Semipalmated Plover (*Charadrius semipalmatus*)	0.53	0.78	0.35
Floating in open water			
Red-breasted Merganser (*Mergus serrator*)	0.59	0.96	0.37
Common Loon (*Gavia immer*)	0.40	0.96	0.16
Surf Scoter (*Melanitta perspicillata*)	0.25	1.00	0.06
Artificial structures + dead treetops			
Osprey (*Pandion haliaetus*)	0.79	0.77	0.80
Black Vulture (*Coragyps atratus*)	0.27	1.00	0.07
Artificial structures + floating in open water			
Double-crested Cormorant (*Phalacrocorax auratus*)	0.73	0.64	0.82
Brown Pelican (*Pelecanus occidentalis*)	0.51	0.45	0.58
Artificial structures + live oyster reefs			
Laughing Gull (*Leucophaeus atricilla*)	0.59	0.67	0.52
Artificial structures + sandbars			
Royal Tern (*Thalasseus maximus*)	0.68	0.58	0.81

Table 2. (Continued) Representative species by habitat features for bird surveys in Mosquito Lagoon, Florida, 2018–2020. The indicator value is based on statistics A and B. Statistic A is the positive predictive value of the species and represents an estimate of the probability that a site belongs to a particular habitat feature based on the presence of the species. Statistic B is the fidelity value of the species and represents an estimate of the probability of finding the species at that particular habitat feature. All values are statistically significant at the $P < 0.05$ level.

Species	Indicator Value	A	B
Dead oyster reefs + live oyster reefs			
American Oystercatcher (*Haematopus palliatus*)	0.62	0.86	0.44
Ruddy Turnstone (*Arenaria interpres*)	0.44	0.89	0.22
Dead treetops + mangroves			
Belted Kingfisher (*Megaceryl alcyon*)	0.54	0.78	0.38
Floating in open water + live oyster reefs			
Ring-billed Gull (*Larus delawarensis*)	0.50	0.80	0.32
Mangroves + live oyster reefs			
White Ibis (*Eudocimus albus*)	0.84	0.83	0.84
Great Blue Heron (*Ardea herodias*)	0.81	0.80	0.82
Great Egret (*Ardea alba*)	0.81	0.91	0.71
Snowy Egret (*Egretta thula*)	0.72	0.93	0.56
Little Blue Heron (*Egretta caerulea*)	0.52	0.65	0.41
Yellow-crowned Night Heron (*Nyctanassa violacea*)	0.51	0.97	0.27
Tricolored Heron (*Egretta tricolor*)	0.49	0.87	0.28
Green Heron (*Butorides virescens*)	0.32	1.00	0.10
Live oyster reefs + sandbars			
Black-bellied Plover (*Pluvialis squatarola*)	0.62	0.86	0.45
Dunlin (*Calidris alpine*)	0.39	0.98	0.15
Forster's Tern (*Sterna forsteri*)	0.29	0.61	0.13

mauri) and Palm Warbler (*Setophaga palmarum*), which were not observed in our study. The combined total number of species identified by Shaffer et al. (2019) and Rifenberg et al. (2021) was 44, and we identified 67 species in this study. Thus, our study provides important, new information about the bird community in Mosquito Lagoon.

Seasonal abundance and richness.—The greater abundance we observed in winter is in contrast to previous studies of wading birds in the region of Kennedy Space Center and Merritt Island National Wildlife Refuge. In two previous studies that included mosquito impoundments, the highest wading bird abundances were reported from February–June and lowest abundances were in winter, which they defined as October–January (Smith and Breininger 1995, Stolen et al. 2002). Some of this

discrepancy was due to differences in how seasons were defined. Smith and Breininger (1995) and Stolen et al. (2002) defined seasons based on the nesting seasons of the birds. In our study, we analyzed data based on meteorological seasons rather than nesting seasons. Additionally, the salinity of the impoundments in these study areas varies based on rainfall and water level (ranging from 0–35 ppt) and is lower than typical salinities in Mosquito Lagoon, which ranges from 22.6–45.2 ppt (Walters et al. 2001, Phlips et al. 2015). The Kennedy Space Center and Merritt Island National Wildlife Refuge area serves as a nesting site for many of Florida's wading birds (Schikorr and Swain 1995, Stolen et al. 2002), which explains why the abundances of wading birds would be higher in that region during pre-nesting and nesting seasons. Stolen (2006) observed the distances that nesting Great Egrets (*Ardea alba*) and Snowy Egrets (*Egretta thula*) flew from their nests to forage and found that the average distances were 6.2 km and 4.7 km, respectively. The distance between the southernmost point of our bird transect route and the northernmost region of Kennedy Space Center and Merritt Island National Wildlife Refuge is nearly 9 km. Wading birds may use Mosquito Lagoon as foraging habitat in the fall and winter but not during spring and summer because of nesting behaviors. The most abundant waterfowl in our study was Red-breasted Merganser (*Mergus serrator*), which was present in high numbers during both winter seasons of the study (3,322 and 1,381 observations, respectively), completely absent in summer and fall, and rare in spring with 3 observations in spring of 2019 and 2 observations in spring of 2020. The high abundance of Red-breasted Mergansers in winter is consistent with the life history of this species; they migrate to Florida each November, and then return to northern breeding grounds (e.g., Great Lakes, New England) in March (Johnsgard 2016).

Wading birds were present in every transect throughout the study, with Great Egrets and White Ibises being the most abundant waders. The abundances of both these species peaked in the winter. Both are permanent residents in Florida, so the seasonal differences in abundances may be due to influxes of individuals migrating from more northern regions within their ranges and birds from nearby regions changing habitat preferences seasonally. The increase in Great Egret abundance during the winter may be, in part, due to an influx of individuals from more northern Atlantic states (Virginia, Maryland, Delaware; Melvin et al. 1999, Nellis 2001). Great Egrets begin southward migration in October to avoid freezing conditions, and return north in February and March (Melvin et al. 1999, Nellis 2001. Additionally, for Great Egrets human disturbance (especially boating within 50 m of nesting sites) is one of the main factors affecting nesting-site suitability (Chapman and Howard 1984). Therefore, these

birds are more likely to nest in areas with less boating activity, such as the designated areas in Kennedy Space Center where there is no public access. This may explain the lower abundance of Great Egrets during the spring months. White Ibis nestlings may become salt stressed, so during nesting (April–September) they tend to forage in freshwater ecosystems, which likely explains why their numbers were lower in Mosquito Lagoon during those seasons than in winter. The high densities of wading birds present during the spring in the 1990 study (up to nearly 4.5 birds/ha) at Kennedy Space Center may be due to the close proximity of that area to important breeding grounds for waders (Breininger and Smith 1990), where the lack of human disturbance provides a more suitable wading bird nesting habitat than central Mosquito Lagoon.

The most abundant seabirds were Ring-billed Gulls (*Larus delawarensis*), Laughing Gulls (*Leucophaeus atricilla*), and Royal Terns (*Thalasseus maximus*). Ring-billed Gulls were present almost exclusively in winter, with 1 observed in spring of 2019, 1 bird observed during September of 2019, and 8 birds observed in November of 2019. This species is migratory, typically beginning southward migration to wintering grounds in September, and beginning the return northward in March; this pattern explains the high abundances in Mosquito Lagoon during winter and general absence during other seasons. Laughing Gulls and Royal Terns are resident species in Mosquito Lagoon and were present in >80% of transects. Both species were most abundant in winter, as populations from northern regions of the United States migrate south for winter. Additionally, Laughing Gulls tend to forage on terrestrial prey items more frequently than marine prey items during nesting (Washburn et al. 2013), which may contribute to their reduced abundance on oyster reefs and sandbars during summer months.

In our study, winter and spring seasons had the highest shorebird abundances. These results are similar to those from an 8-year study of shorebird use of impounded wetlands in Merritt Island National Wildlife Refuge, which found that shorebird numbers were highest from December through April, and then lower from May through November (Epstein 2019). The most abundant shorebirds in our study were Dunlins (*Calidris alpina*), which were present in high numbers during the winter of 2018–2019. The high abundance of Dunlins that we observed is consistent with Epstein's (2019) results, and those from a study in which Dunlins were found to be the most abundant wintering shorebird in 59 of 60 coastal Florida study sites, including sites near Kennedy Space Center and Merritt Island National Wildlife Refuge (Sprandel et al. 2000). Dunlins were also observed in winter of 2019–2020 but in lower numbers than the previous winter. In the fall of 2020, we observed Peregrine Falcons (*Falco peregrinus*) and Merlins

(*Falco columbarius*) on four separate occasions. Falcons are natural predators of Dunlins, and research has indicated that non-breeding populations of Dunlins may be reduced by the presence of falcons (Ydenberg et al. 2017). Further research would be needed to determine if this predator-prey interaction is occurring in Mosquito Lagoon.

In addition to higher bird abundance, species richness peaked in winter (Fig. 3). The increase in number of species observed in winter corresponds with the timing of migratory birds, such as Red-breasted Mergansers and Surf Scoters, wintering in Florida (Johnsgard 2016, Nellis 2001). Thus, the combination of resident and migratory species is most likely the main contributor to the higher richness during winter months.

Bird use of habitat features.—Several bird species were closely associated with either live oyster reefs, dead oyster reefs, or the combination of the two. The Willet (*Tringa semipalmata*) was the top species most closely associated with live oyster reefs. Typical prey items for Willets include mobile and infaunal invertebrates, such as crabs, snails, amphipods, and worms (Nellis 2001), all of which are readily available food sources on either the surface or in the subsurface sediment of live oyster reefs (Rodney and Paynter 2006, zu Ermgassen et al. 2016, Harris 2018). American Oystercatchers (*Haematopus palliatus*), a species that is threatened in Florida, was associated with the combination of dead and live oyster reefs. The main food source for American Oystercatchers is marine bivalves (Nellis 2001), so in Mosquito Lagoon they forage primarily on live oysters clustered on intertidal reefs, making live, intertidal reefs ideal foraging habitats. American Oystercatchers have also been documented nesting on dead oyster reefs in Mosquito Lagoon, which may explain their abundance on dead reefs (Copertino 2021). Least Terns, another state-level threatened species, were associated with dead oyster reefs, where they were observed nesting in Mosquito Lagoon in the summers of 2019 and 2020 (Copertino 2021). A previous study of Least Tern nesting on the Gulf Coast of Florida suggested that disarticulated oyster shell was a preferred substrate for nest site-selection (Mazzocchi and Forys 2005).

Wading birds were most frequently observed in live mangroves or within a meter of trees and on live oyster reefs. Eight different wading bird species were determined to be indicator species for the combination of these two habitat features. Of these, 7 were herons and egrets, including the Little Blue Heron (*Egretta caerulea*) and Tricolored Heron (*Egretta tricolor*), both of which are state-level threatened species. Herons and egrets were most commonly observed on live mangroves or on mangrove shorelines (1,354 observations), but during periods of medium and low water level they were also abundant on live oyster reefs (811 observations). The main prey items for herons and egrets

are crustaceans and fish (Miranda and Collazo 1997, Nellis 2001), both of which are more abundant in structured ecosystems, such as mangrove prop roots and oyster reefs, than unstructured ecosystems (Bloomfield and Gillanders 2005, Boudreaux et al. 2006, Barber et al. 2010, zu Ermgassen et al. 2016). Dietary analysis of herons and egrets in a tropical mangrove swamp in Puerto Rico suggested that some of the most important fish prey items were members of the families Mugilidae (mullets) and Gobiidae (gobies; Miranda and Collazo 1997). Stolen (2006) found that within impounded salt marshes in the northern IRL, fish densities were always higher in vegetated areas than in adjacent unvegetated areas. A recent fish survey in Mosquito Lagoon found mullets in 50% of all seine net catches near shorelines and 18% of catches near oyster reefs (Lewis et al. 2020). Likewise, gobies were found in 73% of shoreline catches and 25% of oyster reef catches (Lewis et al. 2020). Miranda and Collazo (1997) also found crabs and shrimp to be important dietary components of herons and egrets. In a survey of the macroinvertebrates along living shorelines and oyster reefs in Mosquito Lagoon, crabs and shrimp were abundant, making up over 90.8% of individuals caught on natural (non-restored) oyster reefs and 90.9% of individuals caught on natural mangrove shorelines (Searles 2019). The abundance of wading bird prey items concentrated near mangroves and oyster reefs explains the preference by many birds for such habitats.

Shorebirds showed preference for sandbars, with plovers and sandpipers making up 49.2% of the birds observed using this habitat feature. The shorebird species most closely associated with sandbars was the Semipalmated Plover (*Charadrius semipalmatus*). They are small and short-billed, and forage by pecking at small marine invertebrate prey from the surface of sand or mudflats (Nellis 2001). Black-bellied Plovers (*Pluvialis squatarola*) and Dunlins were both associated with the combination of sandbars and live oyster reefs. The larger body size and longer leg length of the Black-bellied Plover (the largest plover species found in Florida) may allow for more maneuverability around the complexities of oyster reefs and the longer bill length of the Dunlin may allow for probing into oyster reef sediments between oyster clusters (Bent 1929, Cornell Lab of Ornithology 2020).

Seabirds, including gulls, terns, pelicans, and cormorants, were frequently observed loafing on oyster reefs and sandbars and perched on artificial structures such as signs and pilings. Previous research on bird use of oyster reefs in Mosquito Lagoon reported that seabirds were among the dominant species seen loafing (which includes any behaviors not associated with feeding or breeding) on dead oyster reefs, and gulls were also among the most abundant birds observed on live oyster reefs (Shaffer et al. 2019). In our study, sandbars and artificial structures were also frequented by seabirds, such as Royal Terns. Previous

research indicates that Royal Terns use artificial structures for perch hunting (Watts 2000), so pilings and sign posts in Mosquito Lagoon likely provide a perch to give the terns an aerial view when searching for prey. These perches may also provide a place of rest, particularly during periods when the water levels are too high for sandbars to be exposed. In our study, the number of Royal Terns observed perched on artificial structures was higher during high water than during either medium or low water conditions ($P < 0.001$ for both). Laughing Gulls were associated with the combination of artificial structures and live oyster reefs. Similar to the Royal Terns, they likely use the signs and pilings as resting places when oyster reefs are submerged. The number of Laughing Gulls perched on artificial structures was also higher during high water than during medium or low water conditions ($P = 0.001$ and $P = 0.002$, respectively). Additionally, Laughing Gulls, which are not as adept at diving as terns, are known to steal food from other seabirds (Burger 1988); this may explain their behavior of perching on signs and pilings near Royal Terns.

Birds of prey were often observed perched either on artificial structures such as signs, pilings, and utility poles, or on dead treetops. Osprey was the species most associated with the combination of artificial structures and dead treetops. Dead tree branches, utility poles, and sign posts all provided perches for Ospreys to both scan for and to consume fish prey (Watts 2000). We frequently observed Osprey eating fish while perched on these structures. While standing dead trees and artificial structures may serve the same purpose as an aerial perch, Osprey may select pilings and sign posts if they are in closer proximity to the surface of the water under turbid conditions.

Our study identifies several species, including some threatened species, that are associated with specific habitat features within Mosquito Lagoon. While these associations may reveal habitat preferences, further research into the individual life histories of species would be required to determine the implications of these associations. However, our data do provide a potential starting point for managers interested in conservation of specific at-risk bird taxa within Mosquito Lagoon.

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Appendix 1. Total counts and percent of observations for each bird species observed in Mosquito Lagoon, Florida, 2018–2020, for each habitat feature and behavior category. LOR = live oyster reefs, DOR = dead oyster reefs, AS = artificial structures, MS = mangroves and mangrove shorelines, DT = dead tree branches, SB = sandbars, WS = wading shallow, FL = floating in open water.

			Percent of observations							
Scientific name	Common name	Count	LOR	DOR	AS	MS	DT	SB	WS	FL
Spatula discors	Blue-winged Teal	66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anas platyrhynchos	Mallard	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anas fulvigula	Mottled Duck	18	0.02	0.00	0.00	0.11	0.00	0.00	0.00	0.02
Melanitta perspicillata	Surf Scoter	27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33
Melanitta americana	Black Scoter	22	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.22
Lophodytes cucullatus	Hooded Merganser	13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15
Mergus serrator	Red-breasted Merganser	4,738	2.83	0.13	0.00	0.42	0.00	0.00	0.00	77.86
Podiceps auritus	Horned Grebe	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Streptopelia decaocto	Eurasian Collared Dove	10	0.00	0.00	0.00	0.00	1.49	0.00	0.00	0.00
Columbina passerina	Common Ground Dove	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zenaida macroura	Mourning Dove	11	0.00	0.13	0.00	0.00	0.25	0.00	0.00	0.00
Coccyzus americanus	Yellow-billed Cuckoo	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rallus crepitans	Clapper Rail	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Antigone canadensis	Sandhill Crane	15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Haematopus palliatus	American Oystercatcher	142	2.15	1.96	0.00	0.00	0.00	1.03	1.35	0.00
Pluvialis squatarola	Black-bellied Plover	225	3.68	2.91	0.00	0.00	0.00	2.95	0.00	0.00
Charadrius semipalmatus	Semipalmated Plover	42	0.00	0.44	0.00	0.00	0.00	3.09	0.00	0.00
Arenaria interpres	Ruddy Turnstone	145	0.78	4.42	0.67	0.00	0.00	0.29	0.00	0.00
Calidris alpina	Dunlin	1,337	15.06	0.13	1.10	0.00	0.00	36.82	0.00	0.00
Calidris minutilla	Least Sandpiper	144	0.12	0.76	0.00	0.00	0.00	3.53	0.00	0.00
Actitis macularius	Spotted Sandpiper	15	0.09	0.13	0.00	0.00	0.00	0.00	0.00	0.00
Tringa semipalmata	Willet	383	4.96	1.52	0.74	0.42	0.00	2.50	21.28	0.00

Appendix 1. (Continued) Total counts and percent of observations for each bird species observed in Mosquito Lagoon, Florida, 2018–2020, for each habitat feature and behavior category. LOR = live oyster reefs, DOR = dead oyster reefs, AS = artificial structures, MS = mangroves and mangrove shorelines, DT = dead tree branches, SB = sandbars, WS = wading shallow, FL = floating in open water.

			Percent of observations							
Scientific name	Common name	Count	LOR	DOR	AS	MS	DT	SB	WS	FL
Tringa melanoleuca	Greater Yellowlegs	1	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Leucophaeus atricilla	Laughing Gull	1,501	16.06	21.05	8.95	0.00	0.25	6.63	0.34	0.70
Larus delawarensis	Ring-billed Gull	2,278	14.38	3.92	12.13	0.26	0.00	8.10	4.05	13.27
Larus argentatus	Herring Gull	6	0.02	0.00	0.06	0.00	0.00	0.44	0.00	0.00
Sternula antillarum	Least Tern	298	0.00	16.12	0.12	0.00	0.00	0.00	0.00	0.00
Hydroprogne caspia	Caspian Tern	203	0.43	2.28	2.14	0.00	0.00	12.52	0.68	0.02
Sterna forsteri	Forster's Tern	59	0.31	0.38	0.61	0.00	0.00	0.29	0.00	0.00
Thalasseus maximus	Royal Tern	1,416	3.61	20.67	33.82	0.00	0.00	12.67	3.38	0.02
Thalasseus sandvicensis	Sandwich Tern	15	0.09	0.38	0.00	0.00	0.00	0.00	0.00	0.00
Rynchops niger	Black Skimmer	112	1.91	0.57	0.00	0.00	0.00	0.00	0.00	0.00
Gavia immer	Common Loon	28	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.46
Mycteria americana	Wood Stork	12	0.07	0.00	0.00	0.11	0.00	0.00	0.00	0.00
Anhinga anghinga	Anhinga	65	0.09	0.00	0.06	1.64	0.99	0.00	0.00	0.06
Phalacrocorax auritus	Double-crested Cormorant	895	0.64	8.34	19.36	0.64	1.74	3.09	3.72	3.71
Pelecanus erythrorhynchos	American White Pelican	51	0.00	1.52	0.00	0.00	0.00	0.00	0.00	0.28
Pelecanus occidentalis	Brown Pelican	846	2.05	4.61	8.76	4.39	0.00	2.06	1.69	2.46
Ardea herodias	Great Blue Heron	643	2.38	2.34	0.55	18.74	2.48	0.29	13.51	0.00
Ardea alba	Great Egret	1,662	12.89	0.63	0.49	39.81	3.47	0.00	23.31	0.02
Egretta thula	Snowy Egret	263	1.70	0.13	0.12	5.98	0.74	0.15	1.35	0.00
Egretta caerulea	Little Blue Heron	191	0.90	2.40	0.06	1.64	0.00	0.15	0.68	0.00
Egretta tricolor	Tricolored Heron	91	0.19	0.00	0.00	2.12	0.25	0.00	1.35	0.00

Appendix 1. (Continued) Total counts and percent of observations for each bird species observed in Mosquito Lagoon, Florida, 2018–2020, for each habitat feature and behavior category. LOR = live oyster reefs, DOR = dead oyster reefs, AS = artificial structures, MS = mangroves and mangrove shorelines, DT = dead tree branches, SB = sandbars, WS = wading shallow, FL = floating in open water.

			Percent of observations							
Scientific name	Common name	Count	LOR	DOR	AS	MS	DT	SB	WS	FL
Bubulcus ibis	Cattle Egret	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Butorides virescens	Green Heron	24	0.12	0.00	0.00	0.48	0.00	0.00	0.00	0.00
Nycticorax nycticorax	Black-crowned Night Heron	42	0.05	0.00	0.00	1.54	0.25	0.00	0.00	0.00
Nyctanassa violacea	Yellow-crowned Night Heron	66	0.78	0.00	0.00	1.32	0.50	0.00	0.00	0.00
Eudocimus albus	White Ibis	1,001	10.06	0.88	0.00	14.61	3.72	2.80	20.95	0.00
Platalea ajaja	Roseate Spoonbill	11	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.00
Coragyps atratus	Black Vulture	33	0.00	0.00	0.43	0.00	0.74	0.00	0.00	0.00
Cathartes aura	Turkey Vulture	127	0.00	0.00	0.12	0.37	4.71	0.00	0.00	0.00
Pandion haliaetus	Osprey	934	0.73	0.32	7.66	2.86	63.77	0.00	2.03	0.00
Circus hudsonius	Northern Harrier	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Haliaeetus leucocephalus	Bald Eagle	27	0.05	0.00	0.43	0.00	0.99	0.15	0.00	0.00
Buteo lineatus	Red-shouldered Hawk	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Buteo jamaicensis	Red-tailed Hawk	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Megaceryle alcyon	Belted Kingfisher	154	0.00	0.00	1.16	2.06	5.96	0.00	0.00	0.00
Falco columbarius	Merlin	5	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00
Falco peregrinus	Peregrine Falcon	3	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00
Tyrannus dominicensis	Gray Kingbird	11	0.00	0.00	0.00	0.00	1.99	0.00	0.00	0.00
Corvus ossifragus	Fish Crow	883	0.05	0.63	0.00	0.11	2.48	0.00	0.00	0.00
Tachycineta bicolor	Tree Swallow	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hirundo rustica	Barn Swallow	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sturnus vulgaris	European Starling	170	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix 1. (Continued) Total counts and percent of observations for each bird species observed in Mosquito Lagoon, Florida, 2018–2020, for each habitat feature and behavior category. LOR = live oyster reefs, DOR = dead oyster reefs, AS = artificial structures, MS = mangroves and mangrove shorelines, DT = dead tree branches, SB = sandbars, WS = wading shallow, FL = floating in open water.

			Percent of observations							
Scientific name	Common name	Count	LOR	DOR	AS	MS	DT	SB	WS	FL
Agelaius phoeniceus	Red-winged Blackbird	233	0.00	0.00	0.00	0.11	0.50	0.00	0.00	0.00
Quiscalus major	Boat-tailed Grackle	16	0.26	0.00	0.00	0.00	0.99	0.00	0.00	0.00
	Unidentified birds	291	0.14	0.19	1.47	0.21	1.24	0.00	0.00	0.44
	Total birds	22,085	19.18	7.16	7.39	8.55	1.82	3.07	1.34	24.64

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VOCALIZATIONS HELP DISTINGUISH MALE AND FEMALE BROWN-HEADED NUTHATCHES (*Sitta pusilla*) IN THE FIELD

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The Brown-headed Nuthatch (*Sitta pusilla*) is a cooperatively breeding species endemic to mature pine forests of the southeastern United States (Slater et al. 2021). Since 2004, we have studied a color-marked nuthatch population on Tall Timbers Research Station (TTRS; Leon County, 30.649, –84.224) with a goal of learning more about the ecological and demographic factors promoting cooperative breeding behavior (Cox and Slater 2007, Cox et al. 2019). Individuals are uniquely color-marked as part of this study either as nestlings at approximately 10 days old (n = 1,861) or by luring individuals into mist nests at later stages of life using conspecific vocalizations (n = 623). Field observations using binoculars and spotting scopes to identify marked individuals now span hundreds of hours and include multiple ($n \geq 5$) field observations of individuals that were sexed using DNA (females = 83; males = 148; Cox et al. 2019). Most published accounts consider male and female nuthatches to be monomorphic (Slater et al. 2021), but we have observed sex-based vocalizations among the color-marked individuals that we believe most birders can use to distinguish males and females in the field.

Nuthatches have four main song types (Slater et al. 2021): *rubber ducky* vocalizations, serial vocalizations, single-note vocalizations, and a *schwee* note. The most distinctive male-female vocalizations are serial vocalizations repeated frequently as individuals forage. The functions of the serial vocalizations are unknown, but they contain recurring notes that are softer than the squeaky, two-syllable *rubber ducky* vocalizations most commonly associated with this species. Female serial vocalizations are higher pitched than male serial vocalizations

and include frequent *peeps* repeated at a rate of roughly 3 per second. Female serial vocalizations also contain distinctive multiple-syllable twitters interspersed among peep notes every 2–3 seconds (Fig. 1). Serial vocalizations produced by males lack the twitter notes produced by females and, to our knowledge, feature many fewer *peep* calls. A lengthy (>1 minute), high-quality recording that features female serial notes almost exclusively is available in the Xeno-canto collection of wild bird recordings (www.xeno-canto.org; catalog number XC138622). A male can be heard intermittently producing the two-syllable *rubbery ducky* call. The recording is from Osceola County, Florida, but we have used the female notes provided in this recording successfully to target-net female nuthatches in the TTRS population and populations found at the limits of the bird's range in the Florida Everglades (n = 9), east Texas (n = 11), and central Oklahoma (n = 38). While subtle geographic variation in the serial vocalizations may exist, regional differences have not been discernable to us.

Other nuthatch vocalizations also exhibit male-female differences that are more difficult to distinguish. The two- and three-syllable *rubber ducky* vocalizations are best distinguished when individuals of both sexes are calling (Niemasik 2019, Slater et al. 2021). We did not find any high-quality examples where both sexes presented *rubber ducky* vocalizations in the Xeno-canto collection or the Macaulay Laboratory (https://www.macaulaylibrary.org/, accessed August 2021). Norris (1958) described a *schwee* note given exclusively by females when exiting a nest. This vocalization is uncommon and also not available in on-line collections. The *schwee* note is also produced during a time of year where sex can be determined easily using other behaviors (females incubate and brood young exclusively). Based on our field work, the *schwee* note also has tonal qualities similar to the begging notes young nuthatches use to solicit food and the pre-copulatory notes females present when performing a wing-quivering display (Slater et al. 2021).

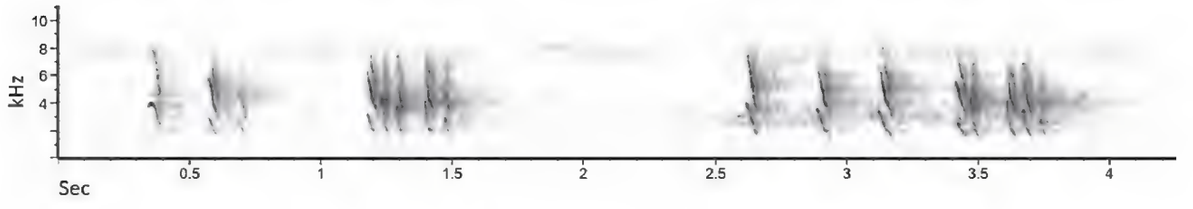

Figure 1. Spectrogram of a high-quality recording of female vocalizations found on Xeno-canto and recorded in Osceola County, Florida, in 2013 (catalog number XC138622). Female peep notes occur first (0.25–0.75 sec) followed by female twitter notes (1.2–1.5 sec). Female peep notes occur again (2.75–3.25 sec) followed again by twitter notes (3.4–4.0 sec). Xeno-canto provides spectrograms of additional nuthatch vocalizations.

Serial vocalizations are best suited for distinguishing sex throughout the year because the vocalizations are produced regularly as individuals forage. The distinctive vocalizations can also help corroborate other methods used to sex individuals. Given the large number of color-marked birds monitored annually (~100), field observations are often made without knowing the sex of the individual. We have observed a few instances (n = 5) where sex assignments based on vocalizations observed in the field differed from the sex assignments based on DNA (n = 231). Sex determination for most of the nuthatches we observed was performed rapidly (≤48 hr) by Avian Biotech International (Tallahassee, FL) using DNA extracted from feathers (Cox et al. 2019). The DNA extracted from feathers, bones, scat, and other low-quality sources regularly contains contaminants that can affect the processes used to determine sex (Robertson and Gemmell 2006). The rates of misclassification observed for other species where low-quality sources of DNA were used were similar to the rate we observed for the nuthatch when comparing vocalization-determined sex to DNA-determined sex (<5%; Robertson and Gemmell 2006, Broquet et al. 2007).

Distinctive sex-based vocalizations are known to exist for several other avian species where sexes appear similar (Enggist-Dueblin and Pfister 2002, Woolfenden and Fitzpatrick 1984). Recognizing these distinctions has improved the data biologists collect in the field and also enhanced our understanding of the evolution of avian song (Odom and Benedict 2018). In the nuthatch, sex determinations made in the field have also led to better insights on complex behaviors such as allopreening and nest defense (Cox 2012, Cusick et al. 2021). Female singing is believed to be an ancestral trait among birds, and further study is likely to uncover similar sex-based differences in the vocalizations other apparently monomorphic species provide. In addition, this type of discovery provides another example of the benefits derived from long-term field studies of color-marked populations.

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DISCOVERY AND EARLY MONITORING OF A NEW FLORIDA GRASSHOPPER SPARROW POPULATION ON RANCHLANDS IN OSCEOLA COUNTY: EVIDENCE OF METAPOPULATION CONNECTIVITY

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Abstract.—In 2012, the critically endangered Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*) was known to exist only on three public conservation areas with native dry prairie habitat. In 2013, an additional site was discovered on a grazed, semi-improved cattle ranch in Osceola County, Florida, USA (hereafter the Ranch). We describe initial results from an effort to establish a long-term demographic monitoring program at the Ranch (2014–2016). Band-resighting data revealed that the Ranch supported a minimum population of 29 territorial males in 2015 and 19 in 2016, representing 39% and 34% of the known wild male population, respectively. The weighted mean for apparent annual survival was 8% for fledged nestlings, 38% for independent fledglings, and 58% for adult males. High rates of nest loss to red imported fire ants (*Solenopsis invicta*) and other predators resulted in very low reproductive success and an estimated productivity of 1.66 young per pair in 2015. During 2013–2016, we documented 10 long-distance dispersal events (range = 12–25 km) for five adult males between the Ranch and other populations. All dispersing males appeared to be unpaired, and several males returned to the Ranch after their initial dispersal, suggesting the movements may have been forays by unpaired individuals searching for females. More extensive monitoring on the Ranch could help determine whether unbanded sparrows detected at the

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site each spring are locally produced or immigrants from other populations. Regardless, because of the size of the population and its central location, the Ranch supports species recovery goals of redundancy, resiliency, and connectivity. We discuss potential management challenges for this population, including high rates of nest failure.

Key words: *Ammodramus savannarum floridanus*, apparent survival, connectivity, DeLuca Preserve, dispersal, pasture, private lands, red imported fire ants

Florida Grasshopper Sparrows (*Ammodramus savannarum floridanus*) are grassland songbirds endemic to south-central Florida. The subspecies is non-migratory and typically occupies treeless expanses of native dry prairie that are burned every 1–3 years (Walsh et al. 1995, Shriver and Vickery 2001, Delany et al. 2002, Hewett Ragheb et al. 2019a). The Florida Grasshopper Sparrow is at high risk of extinction; annual point count surveys revealed a population decline of 77% on all public lands, from 328 males in 1998 to only 75 males in 2012 (Florida Grasshopper Sparrow Working Group [FGSPWG], unpubl. data). Historical population declines have been attributed to a variety of factors, including widespread loss of native dry prairie through conversion to cattle pasture, sod farms, and other agricultural uses (Delany and Linda 1994, Shriver and Vickery 1999, Delany et al. 2007). Estimates of Florida dry prairie coverage before European settlement vary from 203,730 ha to 830,000 ha (Bridges 2006, Delany et al. 2007). As of 2004, only 44,993 ha of the remaining dry prairie were suitable for Florida Grasshopper Sparrows (Delany et al. 2007). The Florida Grasshopper Sparrow was federally listed as endangered in 1986, and the recovery plan states that the subspecies may be down-listed to threatened when 10 sites contain stable, self-sustaining populations each with >50 breeding pairs (USFWS 1999).

The dramatic loss of dry prairie has led to fragmentation of the sparrow populations that remain. In 2008, the subspecies was detected in only five discrete aggregations (Tucker et al. 2010b). By 2012, only three of these aggregations remained, all on public conservation land: Three Lakes Wildlife Management Area (Three Lakes; Osceola County), Kissimmee Prairie Preserve State Park (Kissimmee Prairie; Okeechobee County), and Avon Park Air Force Range (Avon Park; Highlands County; FGSPWG, unpubl. data; Fig. 1). Tucker et al. (2010b) compared demographic rates among these aggregations and concluded that they formed a single metapopulation containing three demographically independent populations linked by very limited dispersal. The Florida Grasshopper Sparrow has been considered highly philopatric and occupies sites that are surrounded predominantly by unsuitable pastures (Delany et al. 1995). Prior to 2013, dispersal between populations had been documented only on two occasions (Miller 2005, Tucker et al. 2010b).

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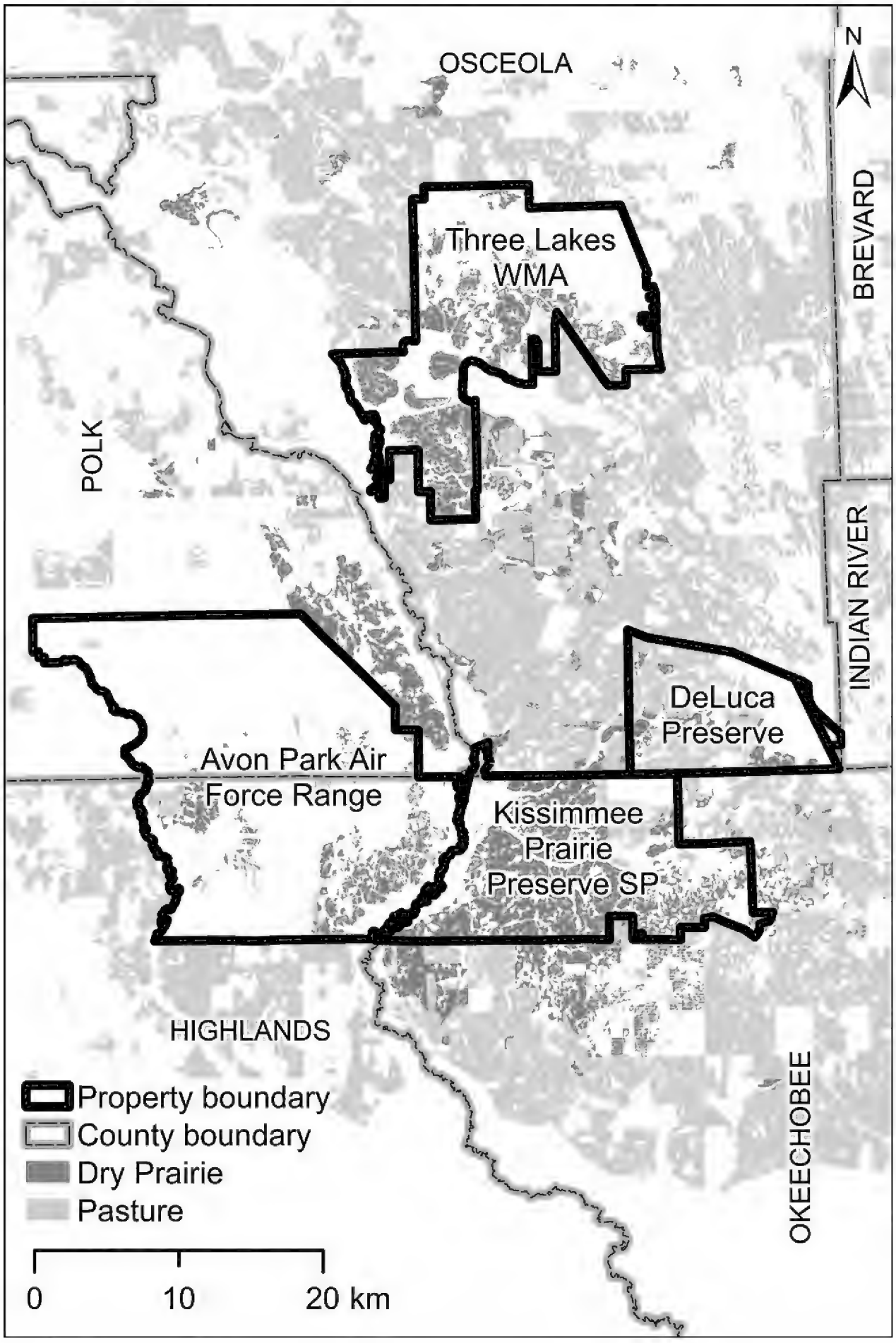

Figure 1. Sites confirmed to be occupied by Florida Grasshopper Sparrows in Central Florida, USA (2013–2016), including the Ranch study site (now DeLuca Preserve). We derived land cover classifications from the Florida Fish and Wildlife Conservation Commission and Florida Natural Areas Inventory, Cooperative Land Cover map, version 3.5 Raster (2021).

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Conversion of dry prairie to improved cattle pasture has resulted in the extirpation of several Florida Grasshopper Sparrow populations in the past (Delany and Linda 1994) and more research is needed to understand how pastures can be managed to meet future conservation goals (Cox et al. 2020). Restoration of ranchland is challenging because tilling and planting nonnative forage grasses such as bahiagrass (*Paspalum notatum*) to create improved pastures for cattle (Willcox et al. 2010) can result in distinct, long-lasting changes to vegetative cover (Larned et al. 2020). There is also a positive relationship between the habitat modifications associated with improving pastures for cattle and the abundance of nonnative red imported fire ants (*Solenopsis invicta*; Tucker et al. 2010a, Tschinkel and King 2017), a formidable predator of Florida Grasshopper Sparrow nestlings (Hewett Ragheb et al. 2019b).

In 2013, a new aggregation of Florida Grasshopper Sparrows was detected on a private cattle ranch in Osceola County, Florida. The development of a research partnership with landowners and state, federal, and university biologists created a unique opportunity to study the demographics of Florida Grasshopper Sparrows occupying semi-improved pasture (i.e., improved pasture with some regrowth of native dry prairie vegetation). We present an estimate of the minimum population size for the site, provide annual survival rates for adult males and first-year birds, and document long-distance dispersal events by banded sparrows to and from the site. We also discuss management challenges and provide recommendations for future research.

Methods

Study site.—During 2014–2016, we studied Florida Grasshopper Sparrows on Destiny Ranch (subsequently established as DeLuca Preserve in 2020) near Yeehaw Junction (27.69967, -80.90428) in Osceola County, Florida, USA (Fig. 1). This site (hereafter the Ranch) was one of four private properties included in a five-year habitat management program (2014–2018) funded through the United States Fish and Wildlife Service's (USFWS) Cooperative Recovery Initiative. The broad goals of the project included 1) searching for Florida Grasshopper Sparrows on private ranchland, 2) investigating existing management practices implemented on ranchland, 3) developing site-specific management plans that incorporate Best Management Practices that benefit the Florida Grasshopper Sparrow on ranchland, and 4) providing financial assistance to private landowners for managing habitat for the benefit of the Florida Grasshopper Sparrow.

A visit by state and federal biologists in May 2013 found at least four male and two female Florida Grasshopper Sparrows each with two dependent young (M. S. Peterson, USFWS, unpubl. data). The status of sparrows prior to 2013 was unknown. Demographic monitoring of Florida Grasshopper Sparrows at the site was first conducted by USFWS and University of Maryland Baltimore County in 2014, followed by the Florida Fish and Wildlife Conservation Commission (FWC) in 2015 and 2016. Since 2017, monitoring has been conducted by staff from the Archbold Biological Station (Venus, Florida, USA).

The primary study area on the Ranch (1,012 ha) was located in the northwestern corner of the property. The area consisted of a matrix of semi-improved cattle pasture (Fig. 2), shrubs, small stands of trees (hammocks), small ponds, and some improved pasture

Figure 2. Semi-improved pasture at the Florida Grasshopper Sparrow study area at the Ranch (now DeLuca Preserve) in Osceola County, Florida, USA. Photo by Archer F. Larned

(Fig. 3). Semi-improved pasture was historically planted with non-native grasses such as bahiagrass for cattle forage, but many sites have been partially recolonized by native dry prairie plants, such as bluestem grasses (*Andropogon* spp.) and saw palmetto (*Serenoa repens*; Willcox et al. 2010; G. Hendricks, Florida Eco Enterprises, LLC, unpubl. data). Shrubs at the Ranch consisted mostly of large clumps of saw palmetto with lesser amounts of southern wax myrtle (*Morella cerifera*), gallberry (*Ilex glabra*), and rarely dwarf live oak (*Quercus minima*; G. Hendricks, unpubl. data).

The site was divided into 11 management units (range = 176–493 ha) separated by dirt roads, seven of which were occupied by Florida Grasshopper Sparrows during this study. Management units at the Ranch were mowed with an elevated mower deck (25 cm average height) every 2–3 years during the dormant season (Jan–Mar) to maintain the habitat for cattle. Prescribed fire at the Ranch was applied irregularly during the dormant (Jan–Mar) or transition (Apr–Jun) seasons. A small portion of the site (~168 ha) was burned in the transition season in 2015 and cattle were not restricted after the burn. Another portion was burned in the dormant season in 2016 (~280 ha) and cattle were excluded until after the sparrow breeding season (E. Myers, USFWS, pers. comm.). The cattle stocking rate was low in all years of the study (~1 animal per 8–9 ha; G. Hendricks, unpubl. data).

Monitoring.—We located territories of male Florida Grasshopper Sparrows by using annual point count surveys (see Delany et al. 2013 for methodology). We placed counting stations approximately 320 m apart in suitable sparrow habitat and sampled annually (Table 1) during 2014–2016 to develop a population index based on a summation of the maximum number of males detected at each station. There is potential for this index

Figure 3. Improved pasture at the Florida Grasshopper Sparrow study area at the Ranch (now DeLuca Preserve) in Osceola County, Florida, USA. Photo by Mary S. Peterson.

method to double count males if they move between stations, so we also attempted to re-sight all birds detected on point count surveys and record band combinations (see below).

We targeted all unbanded male grasshopper sparrows for capture and banding using mist nets and a playback speaker (Delany et al. 1992). We identified adult grasshopper sparrows as either *A. s. pratensis* (migratory subspecies) or *A. s. floridanus* (resident subspecies) using a combination of plumage traits, behavior at time of capture, habitat characteristics, and date of capture. Birds that we identified as *A. s. pratensis* had more tan plumage tones (especially along the edging of the secondary coverts), were often silent prior to capture, and were occasionally found in areas with tall shrubs. In contrast, birds we identified as *A. s. floridanus* had bolder white and black plumage tones, often exhibited typical territorial singing and movement between perches prior to capture, and were rarely located in habitat containing tall shrubs (E. L. Hewett Ragheb, FWC, pers. obs.). We categorized individuals with uncertain subspecies designation early in the breeding season as *A. s. pratensis* unless we resighted them after 1 May. We banded nestlings typically when they were five days old. We captured and banded adult females and independent fledglings opportunistically. We weighed all birds and banded them with a numbered United States Geological Survey (USGS) aluminum band and a unique combination of three plastic color bands. Banding and nest monitoring protocols followed established guidelines for the use of wild birds in research (Fair et al. 2010) and were approved by FWC.

We observed banded Florida Grasshopper Sparrows regularly throughout the breeding season (2014: Jul–Aug; 2015–2016: Apr–Aug) when conducting point count surveys, mapping territories, and searching for nests. We recorded the date, time of day, behavior,

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Table 1. Sampling effort, population estimates, and reproductive activity for Florida Grasshopper Sparrows at the Ranch, Osceola County, Florida, USA, 2014–2016.

	2014	2015	2016
Banding and resighting			
Newly banded adult males	18	13	4[a]
Males banded in previous years as adults	0	14[b]	13[a]
Males banded in previous years as fledglings	0	0	1
Male immigrants from other populations	0	1	1
Estimated unbanded territorial males	N/A	1	0
Total estimated males	≥18	29	19
Nestlings banded (fledged)	1 (1)	16 (11)	6 (0)
Independent fledglings banded	3	6[a]	0
Point count surveys			
Start dates	27 May	30 Mar	28 Mar
End dates	29 May	20 May	26 May
Stations	163	81	59
Replicates	1	3	3
Male population index	23	29	24
Reproductive activity			
Known males with at least one nest	3	15	12
Nests discovered (successful)	3 (1)	29[c] (6)	19[d] (0)

[a]Includes one individual later collected for the captive breeding program.
[b]Includes one individual that dispersed to Kissimmee Prairie Preserve State Park and returned to the Ranch.
[c]Includes two nests deemed certain to fail that were removed for the captive breeding program prior to nestling banding.
[d]Includes four otherwise healthy nests removed for cross-fostering to Three Lakes Wildlife Management Area (2 nests) or collected for captive breeding (2 nests).

and perch locations using a handheld global positioning system (GPS) unit for each observation. We located nests using adult behavioral cues or when we incidentally flushed females. We visited nests every 2–3 days until the nestlings reached five days of age, then daily (from a distance when possible) until nest completion (fledging typically occurs between 7–9 days of age; Vickery 1996; J. Oteyza, FWC, unpubl. data). We considered empty nests containing older nestlings (five days old) on a previous visit to be successful (fledging one nestling) if they showed no sign of predation disturbance and we observed the breeding adults chipping or carrying food nearby. Daily nest survival probabilities in 2015 and 2016 were presented in Hewett Ragheb et al. (2019b).

In 2016, we added nest cameras to most nests, allowing for more accurate assignment of nest fates, and added predator exclosure fences in an attempt to reduce predation by mammals (Hewett Ragheb et al. 2019b). In 2016, the USFWS contracted with J. King (University of Central Florida) to treat the area surrounding four Florida Grasshopper Sparrow nests for red imported fire ants using hot water (Tshinkel and King 2007) as part of a nest-predation reduction pilot study (USFWS, unpubl. data). During 2015–2016, the USFWS collected two adult males, two adult females, the contents of four nests, and one independent fledgling from the Ranch population to supplement the captive breeding program (USFWS 2019; Table 1). In addition, we translocated the contents of two nests to foster nests at Three Lakes to reduce the risk of predation by red imported fire ants (Table 1).

Analysis.—We estimated the apparent annual survival of adult males as the proportion of color-banded birds observed or banded in year *i* that survived and were confidently resighted at least once in year *i*+1. We calculated multiyear mean survival estimates using weighted means based on the number of individuals available to survive each interval. We calculated apparent dependent and independent fledgling survival as the proportion of color-banded dependent or independent fledglings observed in year *i* that we resighted at any point during the breeding season following their hatch year (year *i*+1).

We estimated annual productivity (fledglings/pair) for the Ranch in 2015 by multiplying the number of fledged young per successful nest by the cumulative 21-day nest survival rate and by the maximum number of total nest attempts (of average cycle length) that year. We used an estimate of 3.2 young per successful nest based on the historical results of Perkins et al. (2003), and a cumulative 21-day nest survival rate of 5.9% based on nest survival analysis conducted on unprotected nests at the Ranch in 2015 (Hewett Ragheb et al. 2019b). We calculated the maximum number of nest attempts per year at the Ranch using procedures outlined in Austin (1977) that assume more nest attempts are possible at sites with low nest survival because the cycle length is shorter for failed nests than successful nests. For the nest attempt calculation, we assumed a 160-day breeding season length and a 25-day nest cycle for successful nests (4-day egg laying period and 21-day incubation and nestling period; Perkins et al. 2003). We assumed a 13.5-day resting interval after a successful nest and a 3.5-day resting interval after a failed nest (Perkins et al. 2003). We used an apparent nest survival rate of 21% (6 of 29 nests; this study) to compare results with other studies (Perkins and Vickery 2001, Perkins et al. 2003). Based on this rate, we estimated the mean length of an unsuccessful nest cycle to be 9.3 days (Ricklefs 1973, Austin 1977) and the length of the average nest attempt to be 18.1 days (Ricklefs 1970, Austin 1977). Therefore, we estimated that the maximum number of nest attempts (of average length) per breeding pair that could fit into a 160-day breeding season was 8.8. This estimate is comparable with direct observations of nest attempts by individual female passerines (4–8; Grzybowski and Pease 2005) and previous nest attempt estimates (3.87–6.5) for Florida Grasshopper Sparrows found on sites with higher nest survival rates (Perkins et al. 2003). We did not estimate productivity for 2014 because of small samples or for 2016 when predator exclusion fences were deployed (Hewett Ragheb et al. 2019b).

Results

We banded 35 adult males, 3 adult females, 9 independent fledglings, and 23 nestlings (12 of whom fledged; 2014–2016; Table 1). Band-resighting and territory mapping efforts suggested the presence of 18 males (and an unknown number of unbanded males) in 2014, 29 males (1 unbanded) in 2015, and 19 males (all banded) in 2016 (Table 1). We banded only three adult females, but we estimated at least 15 and 12 adult females in 2015 and 2016, respectively, based on the number of males that had at least one nest (Table 1). Data collected in 2014 were too limited to estimate female population size using the number of active nests. Annual point count indices estimated 23–29 male Florida Grasshopper Sparrows at the Ranch during 2014–2016 (Table 1). In 2016, the point count index yielded a higher estimate for males (n = 24) than the number of uniquely banded males (n = 19). Follow-up band resighting revealed that several banded males were counted at multiple count stations that year.

The aggregation of Florida Grasshopper Sparrows at the Ranch was the second-largest known aggregation in all three years of study, second only to Three Lakes. Adult males from the Ranch accounted for 22% (23 of 104) of the total known male population in 2014 based on point count survey data (band resighting data were not available at all sites; FGSPWG, unpubl. data). Adult males from the Ranch accounted for 39% (28 of 99) and 34% (18 of 71) of the total known male population in 2015 and 2016, respectively, based on band-resighting data (with banded immigrants counted as belonging to the population of initial capture; FGSPWG, unpubl. data).

Apparent first-year survival for birds banded as nestlings (and confirmed to fledge) was 0% (0 of 1) for the 2014–2015 interval and 9% (1 of 11) for the 2015–2016 interval. Apparent first-year survival for birds banded as independent fledglings (and not collected for captive breeding) was 33% (1 of 3) for the 2014–2015 interval and 40% (2 of 5) for the 2015–2016 interval. Apparent annual survival for adult males at the Ranch was 78% during the 2014–2015 interval and 46% during the 2015–2016 interval. The weighted mean for apparent annual survival was 8% for fledged nestlings, 38% for independent fledglings, and 58% for adult males. We did not calculate annual survival rates for females because only three females were banded.

We discovered 51 nests during the study, seven of which fledged young (Table 1). In 2014, we discovered three nests; one fledged at least one nestling and two were depredated in the egg stage. In 2015, we discovered 29 nests; six fledged at least one nestling and 23 failed (21 from suspected predation, one flooded, and one orphaned by the death of the breeding female). In 2016, we discovered 19 nests and installed predator deflection fences (with electric cattle guards) and nest cameras at 18 of these nests. We translocated the nestlings from two nests to foster nests at Three Lakes and the USFWS collected the nestlings from two nests for the captive breeding program. Of the remaining 15 nests, 11 were depredated in the nestling stage, three were flooded in the egg stage, and one was abandoned in the egg stage for unknown reasons. In 2016, red imported fire ants were the most common confirmed predator of depredated nests with cameras and fences (6 of 7 [86%]), followed by red cornsnakes (*Pantherophis guttatus*, 1 of 7 [14%]; Hewett Ragheb et al. 2019b).

Cumulative 21-day nest survival for unprotected nests in 2015 was only 5.9% (Hewett Ragheb et al. 2019b). We estimated that as many as 8 nest attempts per pair may have been possible during the 2015 breeding season because of high nest failure rates over a long breeding season. Estimated productivity in 2015 was 1.66 fledglings per pair (0.83 female fledglings per breeding female, assuming a 50:50 fledgling sex ratio).

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We observed six dispersal events to the Ranch and four dispersal events from the Ranch by five Florida Grasshopper Sparrows during 2013–2016 (Table 2). All dispersing birds were adult males of unknown age at the time of banding. Mean linear dispersal was 18 km (range = 12–25 km). Seven of these movements occurred during the breeding season (11 Apr–22 Jun). For these seven events, the period between the last sighting at the source to the first sighting at the destination was 19 days on average (range = 2–48 days) and the mean dispersal date was 23 May (range = 5 May–16 Jun) if we assume all dispersal events occurred in a single day at the midpoint of possible dispersal dates. Only one dispersing male was confirmed to have nested (in 2015, the year prior to its dispersal to Kissimmee Prairie; Table 2); no nests were associated with other dispersing males found on source or destination sites.

Discussion

At the time of its discovery, the Florida Grasshopper Sparrow population on the Ranch represented the second-largest known aggregation of this critically endangered subspecies and provided valuable opportunities for research and conservation. During 2014–2016, we detected up to 29 male Florida Grasshopper Sparrows at the Ranch. Early monitoring revealed annual survival estimates for adult males that were comparable to studies at other sites (weighted mean = 58%; range = 46–78%). Mean adult male survival at Avon Park was 55% (range = 44–67%) during 1989–1991 (Delany et al. 1993) and 48% (range = 41–56%) during 1995–1997 (Perkins and Vickery 2001). Mean adult male survival at Three Lakes was 53% (range = 24–83%) during 1995–1997 (Perkins and Vickery 2001).

Our estimate of juvenile survival based on band-resighting records for Florida Grasshopper Sparrow nestlings that successfully fledged (weighted mean = 8%, n = 12) was lower than previous estimates based on either a percentage of adult survival (15% [25% of adult survival]; Delany et al. 1993) or indirect estimates (35%; Perkins and Vickery 2001). Cumulative 21-day nest survival rates at the Ranch (2015, 5.9%) were lower than at Three Lakes (2015–2018, 12.7%; Hewett Ragheb et al. 2019b). Perkins and Vickery (2001) estimated that a juvenile survival rate of 38% was needed to maintain a stable population given their estimates of adult survival (52%) and productivity (2.5 fledglings per pair). Despite similar adult male survival (58%), our estimates of productivity (1.66 fledglings per pair) and juvenile survival (8%) at the Ranch were far below those required to maintain a stable population (although our juvenile survival estimate was based on a small sample size). Regardless of the Florida Grasshopper Sparrow's

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Table 2. Dispersal events by banded male Florida Grasshopper Sparrows between the Ranch (R) and Three Lakes Wildlife Management Area (TL) and Kissimmee Prairie Preserve State Park (KP), 2013–2016. N represents the number of separate observation days for a given location and date range. All dispersing males were initially banded as unknown age adults (after hatch year [AHY]) and some were observed in subsequent years (after second year [ASY] or after-third year [ATY]).

Male ID	Site	Observation dates	N	Age	Linear distance (km)
920-62813	TL	11 Apr 2013	1	AHY	
	R	30 May 2013	1	AHY	24.8
	TL	2 May–18 Jul 2014	5	ASY	24.8
1601-31556	R	21 Jul 2014	1	AHY	
	KP	28 Apr–22 May 2015	3	ASY	14.4
	R	15 Jun 2015	1	ASY	16.9
	KP	17 Jun 2015–17 May 2016	7	ASY/ATY	17.0
	R	2 Jun–18 Jul 2016	8	ATY	13.5
2161-86020	R	13 Aug 2014–5 Aug 2015	16	AHY/ASY	
	KP	28 Apr–6 May 2016	2	ATY	12.1
	R	11 May–22 Jul 2016	6	ATY	11.9
920-63547	TL	27 Mar–21 May 2015	13	AHY	
	R	22 Jun–27 Jul 2015	9	AHY	20.8
2631-37422	TL	30 Apr–6 May 2016	2	AHY	
	R	10 May–6 Jul 2016	8	AHY	23.4

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high reproductive potential, red imported fire ant nest predation at the Ranch was more frequent than at Three Lakes (Hewett Ragheb et al. 2019b) and presented one of the greatest challenges to productivity at this site. The Ranch may be supported by unbanded immigrants from neighboring populations; however, additional years of monitoring are needed to generate robust estimates of productivity and juvenile survival and to fully assess demographic trends.

The status of the Ranch aggregation as an independent population or a population integrated with other populations through dispersal needs further study. Wells and Richmond (1995) define a metapopulation as "a set of spatially disjunct populations, among which there is some immigration" and a population as "a group of conspecific individuals that is demographically, genetically, or spatially disjunct from other groups of individuals." Tucker et al. (2010b) used demographic disjunction to assign population status to the Three Lakes, Kissimmee Prairie, and Avon Park sites. Similar population trend comparisons are needed to determine if the Ranch aggregation is demographically independent. The level of genetic disjunction is unknown for the Ranch, but Delany et al. (2000) found little genetic differentiation among known populations at the time when examining randomly amplified polymorphic DNA and microsatellites. In addition, Mylecraine et al. (2008) found substantial variation in microsatellites and mtDNA control region sequences within known populations, no evidence of inbreeding, a lack of genetic structure between populations, and evidence that 8% of all individuals captured in a population likely were immigrants.

The aggregation at the Ranch is spatially disjunct because it is separated from the other populations by landscapes that appear unsuitable for nesting; however, we observed more dispersal events to and from the Ranch in the three years of this study than have been observed in all prior years of research on this subspecies (Miller 1995, Tucker et al. 2010b). The Ranch appears to be an intermediate location for dispersing sparrows; it is located only 16 km, 22 km, and 26 km away from the center of the Florida Grasshopper Sparrow study areas at Kissimmee Prairie, Three Lakes, and Avon Park, respectively (Fig. 1) and therefore has the potential to facilitate connectivity and gene flow among the remaining populations. Infrequent, but regular, dispersal among populations could make the Florida Grasshopper Sparrow less reliant on conservation interventions in the future and is a positive characteristic for the persistence of the subspecies (Carroll et al. 2015, Lowe and Allendorf 2010).

The movement events by Florida Grasshopper Sparrows in this study are congruent with within-season movements observed in migratory Grasshopper Sparrows (Williams and Boyle 2018, 2019) and fitting for a subspecies highly dependent on recently burned prairie.

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The high frequency of dispersal events we observed compared with previous Florida Grasshopper Sparrow studies (Miller 1995, Tucker et al. 2010b) may be the result of increased banding and monitoring efforts across all sites coupled with more efficient communication among research staff during the study. However, the biological significance of these dispersal events remains unclear and deserves more investigation. Most of the dispersing birds eventually returned to their source population (Table 2), suggesting movements may have been exploratory forays rather than permanent breeding dispersal events. The timing of these movements, combined with the lack of breeding activity at their source locations, suggests that the dispersing males in this study were unpaired and searching for females. The lack of breeding evidence post-dispersal and the eventual return of several males implies their search for females was unsuccessful. More banding and resighting data are needed to understand if females are equally mobile, if the timing of their movements differs from males (natal dispersal vs. adult forays), or if it is predominantly unpaired males that move among sites.

This new aggregation at the Ranch provides an opportunity to understand how Florida Grasshopper Sparrows have persisted at this pasture site and to develop habitat management recommendations specific to ranchlands. More research is needed to generate robust demographic rates and trends at this site, and to find solutions to overcome the high rates of nest predation by red imported fire ants. More extensive monitoring in subsequent years may help reveal whether unbanded sparrows at the site are locally produced or immigrants from other populations. Regardless, because of its size and central location, the aggregation at the Ranch has the potential to support subspecies recovery goals (USFWS 1999).

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BA-BA-BACHMAN'S: A NOTE ON SONG PRODUCTION IN JUVENILE BACHMAN'S SPARROWS (*Peucaea aestivalis*)

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Song learning has been studied extensively in avian species because the process has many parallels with human speech production. Humans and songbirds rely heavily on the auditory output of adults to learn how to properly produce sounds, and both are more apt to learn vocalizations during a sensitive period at a young age (Kuhl 2003, Prather et al. 2017). In addition, learning in both taxa involves an early stage that is shaped by auditory feedback (Doupe and Kuhl 1999). During this stage, known as the sensorimotor phase, juvenile songbirds produce vocalizations that mimic the songs of their parents or other adult tutors, similar to the baby babble of human infants (Brenowitz et al. 1997, Doupe and Kuhl 1998, Wada 2010). This early song production, known as subsong, will eventually develop into plastic song, which is characterized by more organization and consistency. At this stage, songs resemble adult song types, but song types are sung with more within-type variation than is typical of an adult repertoire. In addition, more song types are often sung at this stage than will be produced in adulthood (Nordby et al. 2007). The final stage, crystallized song, occurs when individuals sing song types with greater consistency across syllables and between renditions. For species with closed-ended learning, these crystallized song types will be sung throughout adulthood with no acoustic modifications and without adding additional song types to their repertoires (Marler and Peters 1988, Soha and Marler 2001).

The timing and development of song production have been found to vary among the few species that have been studied. Some species, such as the Swamp Sparrow (*Melospiza georgiana*), the Song Sparrow (*Melospiza melodia*; Marler and Peters 1988), and the Zebra Finch (*Taeniopygia guttata*; Immelmann 1969), crystallize their repertoire before the end of their first year. Other species, such as Indigo Bunting (*Passerina cyanea*; Rice and Thompson 1968), Brown-headed Cowbird (*Molothrus ater*; O'Loghlen and Rothstein 1993), and European Starling (*Sturnus vulgaris*; Marler et al. 1994), continue to learn and modify their repertoires for longer periods, crystallizing their repertoires

after their first breeding season. Lastly, there are species like the Canary (*Serinus canarius*), that re-crystalize their repertoires each year (Nottebohm and Nottebohm 1978). Because of the substantial diversity across taxa, detailed studies of song learning in a multitude of species are vital for a comprehensive understanding of song learning and repertoire development across songbirds.

Juvenile songbirds may modify song types after they learn them or drop them from their repertoire entirely before crystallization (Soha and Marler 2001). In the few species that have been studied, the final crystallized repertoire of a songbird is hypothesized to be shaped by social factors (Nordby et al. 2007). For example, Field Sparrows (*Spizella pusilla*) may learn multiple song types before maturation but only retain a single song type that most closely resembles their neighbors once they settle into a territory (Nelson 1992). The process by which young songbirds choose which songs to retain from their plastic song repertoire, and which to drop in the adult crystallized repertoire, is called selective attrition (Nelson and Marler 1994). Several studies demonstrate that individual males often retain songs that closely resemble the songs of neighbors, which suggests a tendency to conform (Nelson 1992, 2000; Nordby et al. 2007). However, the discovery that some songbirds (White-crowned Sparrows [*Zonotrichia leucophrys*] and Song Sparrows) learn songs accurately from tutors and subsequently modify them to make them less similar to their tutors suggests an opposing selective force for uniqueness (Nordby et al. 2007, Soha and Marler 2001). These authors propose that selective attrition may enable individuals to select song types with the appropriate level of similarity to neighbor songs, in accordance with the opposing forces of conformity and uniqueness. It is important to study selective attrition in many species to better understand how the selective advantages of conformality or uniqueness may vary across taxa because of social and ecological factors. Conducting studies on birds with moderate to large repertoires is especially important because these birds are learning and retaining far more song types than related species. For example, in three species whose song learning has been studied in-depth, repertoire sizes are small: White-crowned Sparrows typically sing only 1–3 song types (Chilton et al. 1996), Swamp Sparrows have an average repertoire size of three songs (Ballentine et al. 2004), and Song Sparrows have medium repertoires consisting of 6–12 song types (Stoddard et al. 1990). To better understand how larger repertoires develop and the selective forces that affect repertoire selection in adulthood, song production learning should be documented across learning stages for many species, especially those who display large repertoires.

The Bachman's Sparrow (*Peucaea aestivalis*) is a near-threatened oscine that resides in the pine flatwoods of the southeastern United

States (Dunning et al. 2020). They are resident throughout most of their range, typically non-migratory, and tend to settle relatively close to their natal populations (Stevenson and Anderson 1994). The breeding season of Bachman's Sparrow typically spans from March to July, although some individuals may sing as late as September (Meanley 1959). Peak season occurs in April and May and is characterized by a high abundance of broadcast song (Haggerty 1988). Earlier studies of Bachman's Sparrows estimated a repertoire of 34–45 broadcast song types, called primary songs (Borror 1971, Wolf 1977). More recent studies have documented larger repertoires, on average 48 song types per male (Niederhauser 2020). Young male Bachman's Sparrows learn songs from adult conspecifics, but little is known about the process and timing of song development in this species (Dunning et al. 2020). Previous field observations have described juvenile Bachman's Sparrows singing songs that loosely resemble adult songs a few months after hatching (Cox et al. 2014). However, to our knowledge, no study has documented or analyzed juvenile songs in this species.

Documenting the development of song production in a wider variety of species will lead to a better understanding of variation in early song development, the factors that affect repertoire crystallization, and the constraints encountered during ontogeny. In addition, understanding the cultural factors that influence song development in oscines can aid conservation efforts for at-risk species (Laiolo et al. 2008, Parker et al. 2012, Crates et al. 2021). If Bachman's Sparrows continue to decline, fewer adult tutors will be available to teach song types to juveniles. The lack of available tutors could result in abnormalities in song learning, which could, in turn, lead to a decrease in the number of offspring being produced (Courchamp et al. 2008, Crates et al. 2021). This could occur if females prefer accurately learned population norms and discriminate against males who learn songs incorrectly (Crates et al. 2021).

Field methods.—During the 2021 breeding season, we conducted a study on adult Bachman's Sparrows in Jonathan Dickinson State Park in Hobe Sound, Florida. The primary goal of our research was to obtain recordings of full repertoires for our banded adult males. However, towards the end of the breeding season (July), we came across several juvenile Bachman's Sparrows that were actively singing. We recorded five juveniles, which we identified by streaked plumage on their throats and breasts that is not seen in adult birds (Dunning et al. 2020; Fig. 1). We recorded songs using a digital recorder (TASCAM DR-100 Mk II, TEAC, Tokyo, Japan) connected to a microphone (SM57, Shure, Niles, IL, USA) mounted on a parabola (PBR-300, Sony, Tokyo, Japan) between 0700 and 1100 hours. The sampling rate of our recordings was 44,100 Hz, and our bit depth was at 16 bits. We did not make any audio compressions on the sound files.

For all obtained recordings of juveniles, we used Raven Pro bioacoustics analysis software (Raven Pro: 78 Interactive Sound Analysis Software, version 1.6.; Cornell Lab of Ornithology, Ithaca, NY, USA) to visualize spectrograms (Fig. 2). We compared recordings to other vocalizations of Bachman's Sparrows, including song-like vocalizations produced by females (Cox et al. 2014) to confirm that the putative juvenile songs were

Figure 1. A juvenile Bachman's Sparrow (left) is slightly smaller in size and has a striping pattern that extends from the neck to the underbelly. As the juvenile ages, the striping will fade. The juvenile pictured above was captured from the same social group in which the plastic song recording was obtained. The adult male (right) has faded dark patches on the chest and no striping.

not produced by females. We analyzed each recording using the categorizations and descriptions of vocal development stages in Marler and Peters (1981). We classified songs that appeared disorganized with highly variable frequency ranges and no clear structure as subsong. We classified songs that featured more developed syllables, a more organized note structure, and greater consistency in the frequency range of trilled notes as plastic song. The features of these songs were comparable to the plastic songs of other sparrow species (Nottebohm 1970, Marler and Peters 1988, Nordby et al. 2007). Because we had no way of predicting which song types a recorded juvenile would retain into adulthood, we did not classify any as crystalized songs. We conducted all research in accordance with approved animal care protocols from Florida Atlantic University's Institutional Animal Care and Use Committee (A19-01). We obtained permits from the Florida Department of Environmental Protection (02241720), Florida Fish and Wildlife Conservation Commission (LSSC-15-00100D), and United States Geological Survey (23982).

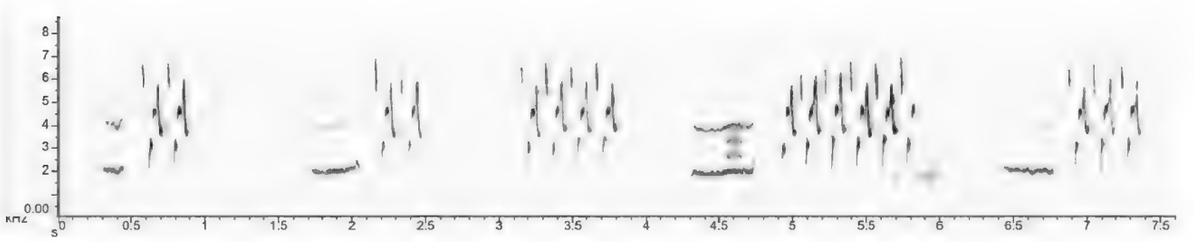

Figure 2. Spectrogram of song renditions of song type 64 sung by a juvenile Bachman's Sparrow in Hobe Sound, Florida, on 28 July 2021. There is a high degree of diversity in the duration of the introductory note and subsequent syllables with each repetition of the song type. The cross-correlation coefficient of each rendition, as calculated by spectrographic cross-correlation, was 0.58. This high diversity is seldom seen in the songs of adult males with crystalized repertoires.

Recorded songs.—Our first two recordings, made on 4 June (0756), both contained subsong. The recordings were of two juveniles who were singing in close proximity to each other and remained together while foraging. In Bachman's Sparrow, a pair's first brood fledges between May and June, approximately 9–10 days after hatching (Haggerty 1988). The fledglings we observed on 4 June had significant plumage striping and were noticeably smaller than adult Bachman's Sparrows. Based on our observations and the average nesting time, we estimated the two juveniles recorded on this day to be between 45 and 55 days old. We made this estimate based on when fledglings leave the nest and natal territory (Haggerty 1988, Stober and Krementz 2000). At the time of this recording, the adult males that we observed across our field site were actively singing and spent much of their time following their young.

On 22 July, we recorded another singing juvenile during our field observations. This juvenile was noticeably larger than the juveniles recorded previously and was comparable in size to the adults; however, it had faded striping patterns on the breast and belly, indicating it was a juvenile bird. The striping was much less apparent than that observed on younger juveniles and had been partially replaced by unmarked feathers on the breast and belly. This singing fledgling was associated with a group of four other individuals that appeared similar in size and plumage characteristics; thus, we inferred that all five individuals were approximately the same age.

We were able to capture one of the individuals from the group and obtain morphological measurements, which were similar to the average measurements obtained from 35 adult males during the previous months (Table 1). We cannot say for certain that the individual we captured was the same individual from which we recorded songs because the bird ceased singing during our capture attempt and the five birds intermingled. Based on the appearance of the juvenile we recorded and known averages of Bachman's Sparrow fledgling measurements, we estimated the age of the individual to be between

Table 1. We compared the measurements of a juvenile Bachman's Sparrow in Hobe Sound, Florida, in 2021 to the average measurements of 32 adult birds. The juvenile was close to the average measurements (within the standard deviation) for all measurements taken except tail length, which was notably shorter.

	Captured juvenile	Adult mean	SD	SE
Wing chord (mm)	57	58.1	2.29	0.40
Tail length (mm)	56	62.6	3.23	0.57
Tarsus (mm)	18.39	19.3	1.03	0.81
Mass (g)	19.0	18.8	1.09	0.19

80–90 days old. This estimation is based on guidance from published literature on aging passerines (Pyle 1979). The recordings obtained from this juvenile contained a mix of subsong and plastic song. During the time of this recording, very few adult males could be heard singing.

On 28 July 2021, we recorded a fourth juvenile. This juvenile was similar in appearance to the juvenile observed on 22 July. It appeared to be the size of an adult but had minimal striping on the breast and belly that is atypical of adult plumage. We observed this individual in a group of seven birds, supporting our previous observations of juveniles associating in groups. Because the average clutch size of a Bachman's Sparrow is 3.9 ± 0.84 (SD; range = 2–5) eggs (Haggerty 1988), we assumed individuals in this group were from multiple clutches and moving together after fledgling. While recording this individual, we obtained >10 minutes of plastic song. We did not detect subsong during the singing bout. This suggests that the bird was farther along in his song development than the individual recorded on 22 July.

One major difference between the fourth individual and the individual recorded on 22 July is that the former sung strictly plastic songs with much more syllable consistency. Song type 64 was sung less consistently than others (Fig. 2).

We obtained a fifth and final recording on 28 July immediately after we recorded the bird described above singing plastic song on a neighboring territory. This juvenile was nearly identical in size and plumage to the other birds observed on this date. However, he appeared to be alone and we detected no other juveniles nearby. This individual sang only subsong, with no examples of plastic song.

Qualities of juvenile songs.—Visual inspection of spectrograms revealed that most juvenile vocalizations started with a whistle or buzz note, which is the typical introductory element in the primary songs of adults. We found these introductory notes even in subsong, although they sometimes followed trilled syllables instead of preceding them. The subsongs that we heard in the field and that we viewed using spectrograms had an initial buzz or trill that was followed by quieter syllables and appear disorganized and jumbled as compared to adult primary songs (Fig. 3A). This haphazard arrangement of notes and syllables is a defining characteristic of subsong and can be found in many other species, such as Black-capped Chickadees (*Poecile atricapillus*) and Common Chaffinches (*Fringilla coelebs*; Thorpe and Pilcher 1958, Ficken et al. 1978). In plastic song, syllables following a buzz or pure tone were more consistent compared to subsong, and consistent trills were more common in plastic songs.

We identified two distinct song types from the juvenile recording obtained on 22 July and several more song types from the juvenile

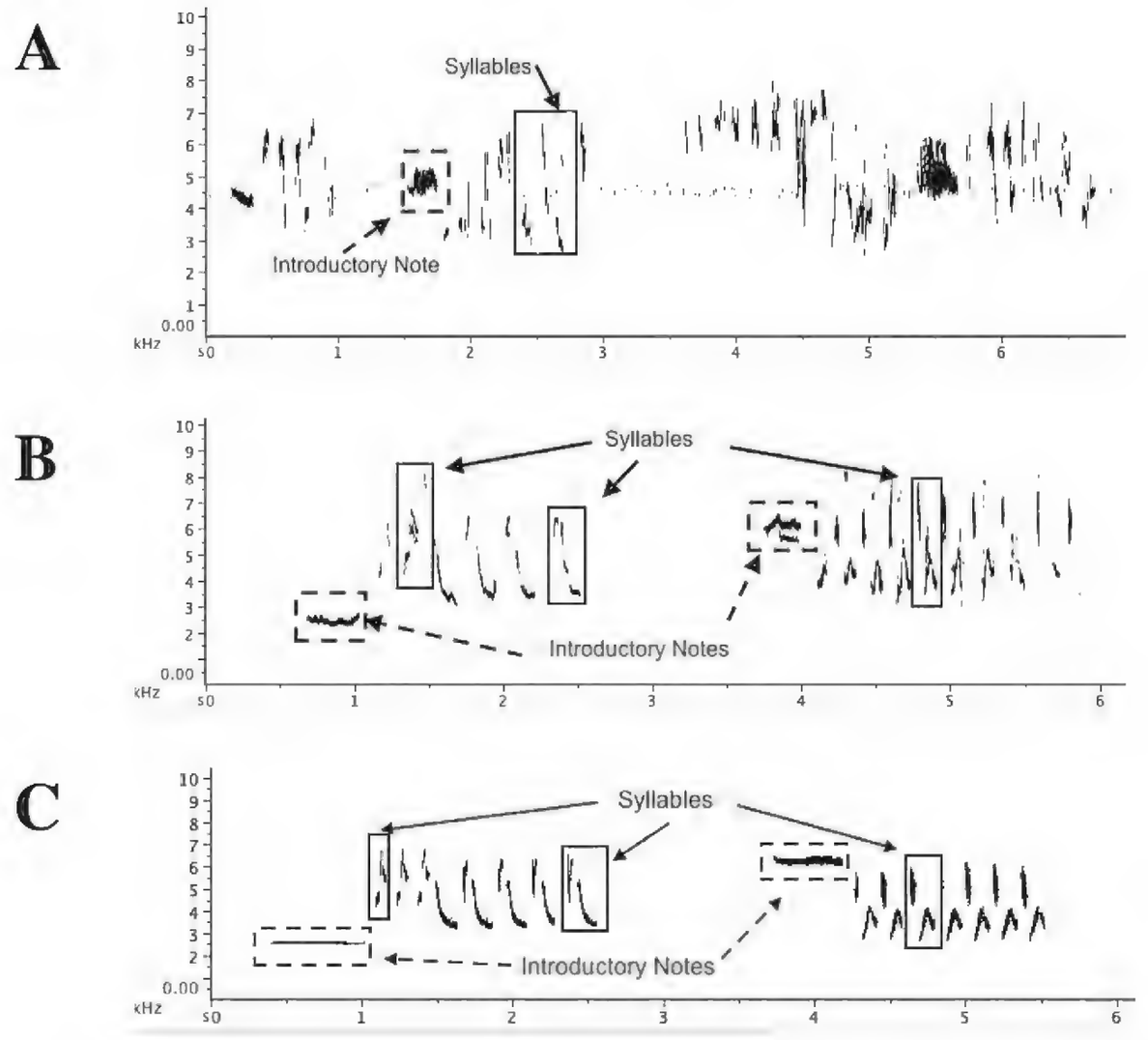

Figure 3. The three spectrograms above depict putative examples of Bachman's Sparrow subsong (A), plastic song (B), and crystallized adult song (C) in Hobe Sound, Florida. The subsong (A), recorded on 4 June 2021, appears disorganized and highly variable. It consists of jumbled trills and introductory notes in no clear order. The notes are sung at variable frequencies. This represents the first stage of sensorimotor development. The plastic song (B), recorded on 22 July 2021, shows a more organized structure. Here, the bird pairs an introductory note with one or two different syllables, as is common for adult songs. However, the notes still show some frequency instability, including variation in the introductory note. During this stage of development, the bird will repeatedly practice these song types and eventually crystallize them, with high consistency among renditions. The adult song (C) shows examples of two crystallized song types. Individual Bachman's Sparrows have on average 48 different song types in their final, crystallized repertoire.

singing plastic song on 28 July. We also recorded these song types from adult birds in our population. We judged the acoustic characteristics of these juvenile and adult songs to be similar and could be classified as the same song types (Fig. 3).

Because the fourth juvenile that we recorded on 28 July sang only plastic song and repeated many of his song types quite frequently, we

were able to compare the consistency of the renditions of each type to the same song types sung by adults. We selected three song types that were repeated multiple times in both the juvenile and an adult we recorded during the same field season. We used a spectrographic cross-correlation method (SPCC) to measure consistency among songs. Spectrographic cross-correlation is a method commonly used to compare the similarity of songs within and between individuals (Lahti et al. 2011, Nelson and Marler 1994, Sawant et al. 2022). For analyzing song rendition consistency among songs of the juvenile and adult, we used the warbleR package (Araya-Salas and Smith-Vidaurre 2017) in R studio, using the cross_correlation() function (Table 2; Fig. 4). Although our sample of two birds does not allow for statistical comparisons, we judged there to be similarity in song consistency between the songs of the juvenile and the adult (Table 2).

Discussion.—To our knowledge, our observations and audio recordings are the first known recordings of subsong and plastic song in juvenile Bachman's Sparrows. By examining opportunistically recorded juvenile songs, we were able to gain insights into how songs develop in this species. For example, in most instances of juvenile song that we recorded, an introductory note precedes trilled syllables, as is the case for all adult song types. Introductory notes can serve as species identifiers in songbirds (Emlen 1972, Hudson and Shizuka 2017, Soha and Marler 2001, Williams et al. 2013). If Bachman's Sparrows also use introductory notes to identify conspecific songs, then additional selective pressure might enforce early learning of this portion of primary song types. Juveniles also must learn the syntactic structure of typical adult songs, meaning they must learn to sing the introductory note before the trilled syllable. Because the introductory note was sometimes found after the trilled syllable in subsongs, we infer that proper syntax is learned with practice and improves over time.

Table 2. The correlation coefficients from spectrographic cross-correlation conducted in WarbleR between three different song types that were produced by one juvenile and one adult Bachman's Sparrow in Hobe Sound, Florida, in 2021. Values approaching 0 indicate high dissimilarity between song renditions and values approaching 1 indicate high similarity between song renditions. Mean values for the juvenile were slightly lower overall but highly similar to the adult.

Age group	Song type	Mean	SD	SE	Range
Juvenile	19	0.708	0.219	0.073	(0.52, 1)
Adult	19	0.715	0.185	0.03	(0.44, 1)
Juvenile	27	0.833	0.127	0.042	(0.71, 1)
Adult	27	0.864	0.103	0.034	(0.77, 1)
Juvenile	52	0.71	0.178	0.035	(0.43, 1)
Adult	52	0.746	0.155	0.031	(0.56, 1)

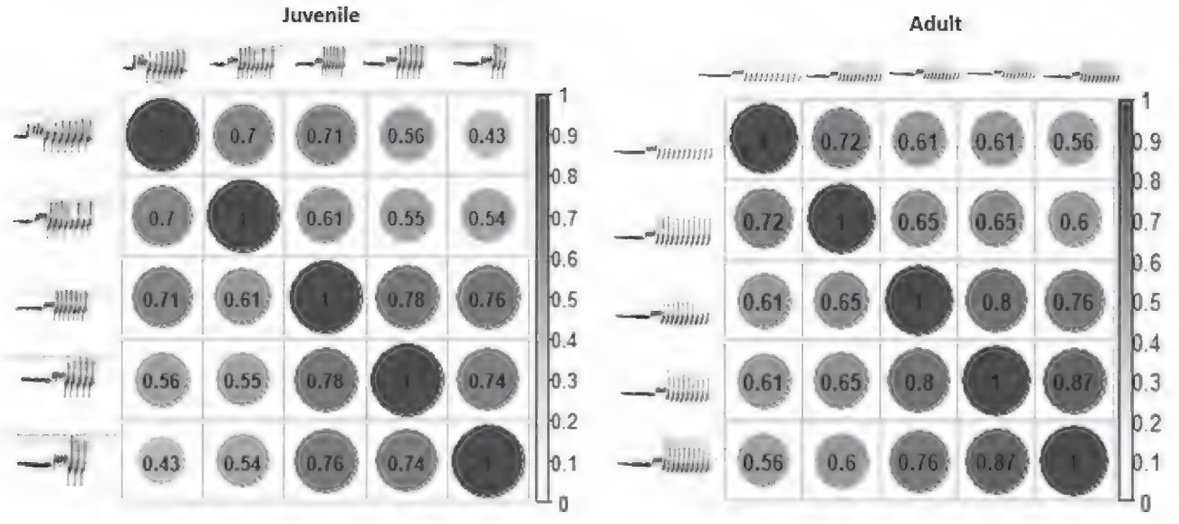

Figure 4. Matrix of pairwise correlation coefficients from spectrographic cross-correlation on song renditions from song type 52 of Bachman's Sparrows in Hobe Sound, Florida, in 2021. Each spectrogram represents one song, with a total of 5 songs being used to compare renditions for the juvenile and adult. Values approaching 0 indicate high dissimilarity between song renditions and values approaching 1 indicate high similarity.

Studies on syntax in Zebra Finches have demonstrated that proper syntax patterns are indeed learned later in development, possibly to allow more room for experimentation and differential learning strategies during the subsong and plastic song stages (Gardner et al. 2005). In addition, we observed that notes are jumbled frequently during subsong but then grouped into patterns, or trills, during plastic song production. This is another example of the development of syntax structure as the birds age. Further study is needed to determine the timing of the stages of song development and the gradual change in key aspects of song production in this species.

In addition to documenting the plastic song and subsong, we also gained insight into the social behavior of juvenile sparrows. During our observations, we commonly spotted juveniles in groups of 3–8 individuals. Templeton et al. (2012) studied a non-migratory population of Song Sparrows and discovered that juvenile Song Sparrows formed social groups of 9–12 young birds within a 10-m radius (2012). In addition, they found that this number changed throughout the seasons, with group size decreasing in the late summer and autumn. Female Bachman's Sparrows lay an average of 3.9 eggs ± 0.84 (SD) eggs per clutch (Haggerty 1988) so it is unlikely that all the juveniles observed in larger groups were from the same clutch. This observation suggests the presence of social groups similar to those observed in some Song Sparrow populations. The social factors shaping crystallized repertoires might begin during

the juvenile stage, and it is possible that these social groups could be influential in the song learning process. Further study is needed to document the details of song development in Bachman's Sparrow, and how juvenile social groups might influence the crystallization of repertoires.

During our field observations we recorded five examples of juvenile song representing two distinct stages of song learning, both the subsong stage and the plastic song stage. We observed both stages in juvenile Bachman's Sparrows in the same nesting season; therefore, we suggest that juveniles are in the sensorimotor phase of song development when they are approximately 45–55 days old and mastery of at least some song types is likely to occur in the summer of their hatch year at 80–90 days of age. However, it is still unknown how long these stages last and when the period of song learning ends. In addition, our observations suggest that juvenile Bachman's Sparrows may form social groups that may include individuals from more than one brood and may provide benefits for song development. Further studies of song learning in juveniles will be useful in better defining how juveniles form groups and how these associations might aid and shape song development.

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RE-EVALUATION OF THREE MYNAS PHOTOGRAPHED IN MIAMI-DADE COUNTY, FLORIDA IN APRIL 1987

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Archived photographs offer the opportunity to re-examine bird records from years past, and if necessary, to correct identifications made in error. In this note, I correct the identification of three mynas that I photographed at Kendall, Miami-Dade County, Florida in April 1987 and identified as Crested Mynas (*Acridotheres cristatellus*). This re-evaluation should remove Crested Myna from the list of exotic birds that have been verifiably recorded in Florida (Greenlaw et al. 2014).

On 17 April 1987, Bruce Neville, Dave Goodwin, and I were birding in urban Miami-Dade County, Florida, looking for exotic birds. At the Kendale Lakes Plaza shopping center in Kendall, we found three *Acridotheres* mynas (Pranty 1987). The birds were walking across a small, landscaped island in the parking lot. I took one photograph (an Ektachrome slide) of the mynas, which I digitally scanned into a .JPG decades later (Fig. 1). Because my camera did not have a powerful telephoto lens, the mynas in my photograph are tiny but in focus, and the lighting was good (although the scanned image came out darker than the slide). According to Bruce, three species of *Acridotheres* mynas had recently been discovered in urban Miami-Dade County: Crested Myna, Common Myna (*A. tristis*), and Jungle Myna (*A. fuscus*). As I had never seen any *Acridotheres* myna before, I did not know what field marks to look for, and no contemporaneous North American field guide included Common Myna or Jungle Myna. No other birder in Florida had obtained verifiable evidence (photographs, audio or video recordings, or specimens) previously or subsequently to document the presence of Crested Myna or Jungle Myna in Florida. As a result,

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Figure 1. Three Common Mynas at Kendale Lakes Plaza, Kendall, Miami-Dade County, Florida, 17 April 1987. These birds were long thought to represent either Crested Mynas or Jungle Mynas but were recently reassessed to be Common Mynas. Photograph by Bill Pranty.

my photograph was long considered to represent the sole evidence to support one of these two species (Greenlaw et al. 2014).

I have seen Common Mynas in Florida on more than 50 subsequent occasions, and I wrote a paper (Pranty 2007) on their status and distribution in the state. I have not encountered Crested Myna or Jungle Myna subsequently—nor, as it turns out, previously! An unpublished pamphlet on the exotic avifauna of Miami-Dade County written by Bruce Neville in 1988 stated that Common Mynas "... are easy to see in the parking lots of Kendale Lakes Mall and Campbell Square Mall...," while Crested and Jungle mynas ". . . occur only in the immediate vicinity of Miami International Airport . . . ," a distance 17 km northeast of Kendale Lakes Plaza.

The mynas in my photograph (Fig. 1) appear to have wholly black bodies except for whitish undertail coverts and a bold white wing patch. The short bills are not clearly visible, but the legs and feet appear to be yellow. I considered a small yellow patch on the side of the head of each myna to be its eye, even though the yellow appears to be larger and kidney-bean shaped on the rightmost myna. Once I purchased Feare and Craig (1998) and studied the plates years later, I decided that Crested Myna was a better match for the Kendale Lakes mynas, but I was not positive that Jungle Myna could be ruled out. I published the Kendale Lakes mynas as Crested Mynas in a non-annotated list (Pranty 2004) and in Greenlaw et al. (2014), but I mentioned in the latter publication that the birds ". . . may refer to Jungle Myna."

In 2021, I joined iNaturalist, a community of hundreds of thousands of observers who contribute to a database of the world's floral and faunal taxa. Identifications are based entirely on community review; a sighting is not considered to be research grade and thereby scientifically valid until at least one other contributor independently agrees with

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the original identification. If multiple identifications are offered, then a super-majority opinion is needed before an iNaturalist record is considered research grade. iNaturalist tracks via a leaderboard those observers who have provided the most identifications for any taxon, and these observers can be tagged to review other observations of the same taxon or related taxa. In hopes of finally resolving the identification of the Kendale Lakes mynas from April 1987, I posted my photograph to iNaturalist in June 2022 as Crested Mynas, and I tagged the top 10 observers for Crested Myna, Jungle Myna, and typical mynas (genus *Acridotheres*), requesting their input. I did not seek input from top identifiers of Common Myna because I long considered that the apparently wholly black bodies of the Kendale Lakes mynas ruled out that species.

To my surprise, the unanimous opinion of the five experts who responded to my request was that the birds were Common Mynas! One observer, John Allcock, based in Hong Kong, suggested that the yellow area of the side of each myna's head was too large to represent the eye, and instead represented bare facial skin. This bare skin is present on Common Myna but is absent on Crested Myna and Jungle Myna. He also suggested that Common Mynas can look all black from a distance or in less-than-ideal lighting conditions. The comments by John Allcock, along with my re-reading of Neville's 1988 pamphlet and finding Neville's (1987) eBird checklist for 17 April 1987, in which he lists three Common Mynas at Kendale Lakes Plaza, has allowed me to concur that the Kendale Lakes *Acridotheres* mynas were Common Mynas. With my photograph (Fig. 1) now accepted to be Common Mynas, there no longer is any known, archived, verifiable evidence to support the presence of Crested Myna in Florida. Therefore, Crested Myna should now be removed from the list of exotic birds in Florida whose presence can be verified by tangible evidence (Greenlaw et al. 2014). I appreciate the opportunity to correct an identification that improves our knowledge of the avifauna of Florida.

ACKNOWLEDGMENTS

I thank the iNaturalist observers who identified the mynas: John Allcock, Allen Lyu, Nat Panda, "elandrev," and "zinogre." Don Fraser, Valeri Ponzo, and an anonymous reviewer improved drafts of the manuscript.

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Florida Field Naturalist 50(4):91–93, 2022.

APPARENT TOOL USE BY A BLACK-AND-WHITE WARBLER (*Mniotilta varia*)

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Tool use by birds has been documented among more than 30 families worldwide (Shumaker et al. 2011). Shumaker et al. (2011) have identified 21 different modes of tool use in birds. On 25 April 2022, one of us (PJ) photographed a Black-and-white Warbler (*Mniotilta varia*) in the Mason Farm Biological Reserve, Chapel Hill, North Carolina during a feeding bout holding a twig positioned lengthwise in its bill immediately above a crevice in the bark of an arboreal vine on which it was foraging.

The Black-and-white Warbler is a bark-foraging specialist that creeps along the bark of trunks and branches much like a nuthatch but also gleans insects from leaves and outer branches as do many other wood-warblers (Kricher 2020). Four species of nuthatch (Brown-headed Nuthatch [*Sitta pusilla*], White-breasted Nuthatch [*S. carolinensis*], Pygmy Nuthatch [*S. pygmaea*], Eurasian Nuthatch [*S. europaea*]) have been observed using bark scales or pieces of wood to pry bark from tree trunks and limbs to expose invertebrates while foraging (Morse 1968, Mitchell 1993, Pranty 1995, Slater et al. 2021, Gray et al. 2016, Rutz and Deans 2018, Kingery and Ghalambor 2020). Of these four species, three species occur in North America and one species occurs in Europe (Rutz and Deans 2018). We suspect that the Black-and-white Warbler was using the twig to probe for invertebrates in crevices in the bark, which is the most common mode of tool use in birds (Shumaker et al. 2011). Alternatively, the warbler may have been using the twig to pry bark from the trunk of the vine to expose invertebrates (Shumaker et al. 2011).

Numbers of observations of tool use among birds are highest among passerines (Shumaker et al. 2011). Yet with one exception, observations of stick and bark tool use in wild birds have been restricted to extractive foraging (Shumaker 2011, Fayet et al. 2020). Tool use among bark-foraging insectivores that do not have extreme morphological specialization for extraction of insects would appear to be a behavioral adaptation for extracting inaccessible prey (Tebbich et al. 2002, Shumaker et al. 2011).

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A series of sequential photographs taken over a 38-s feeding bout provides indirect evidence for tool use in the Black-and-white Warbler. The first photograph taken at the beginning of the feeding bout at 1530:14 h:s EST of the dorsal side of the bird shows the Black-and-white Warbler braced in a horizonal position on a vertical vine (Fig. 1A). Because the bird's ventral side is hidden in the photograph (Fig. 1A), it is not possible to observe whether the bird was using a twig as a tool in this photograph. The second photograph in this sequential series (Fig. 1B), taken 4 s later (1530:18 h:s) of the lateral side of the bird on the same vine, shows the Black-and-white Warbler holding a twig approximately 20.9 mm in length. We calculated twig length by measuring twig and culmen length in the photograph with a caliper and comparing these values to known mean culmen length (12.2 mm) of the Black-and-white Warbler along the Atlantic Coast (Kricher 2020). The twig, which the Black-and-white Warbler was holding lengthwise, extended approximately 14.3 mm beyond the tip of the upper mandible and roughly 5.0 mm above a crevice in the bark of the vine. The third photograph in this sequential series, taken 31 s after the second photograph (1530:49 h:s) of the lateral side of the bird, shows the Black-and-white Warbler perched on a branch adjacent to the vine holding a caterpillar in its bill (Fig. 1C).

During this feeding bout, it is very likely, based on the size of the caterpillar relative to crevice width in the bark of the arboreal vine,

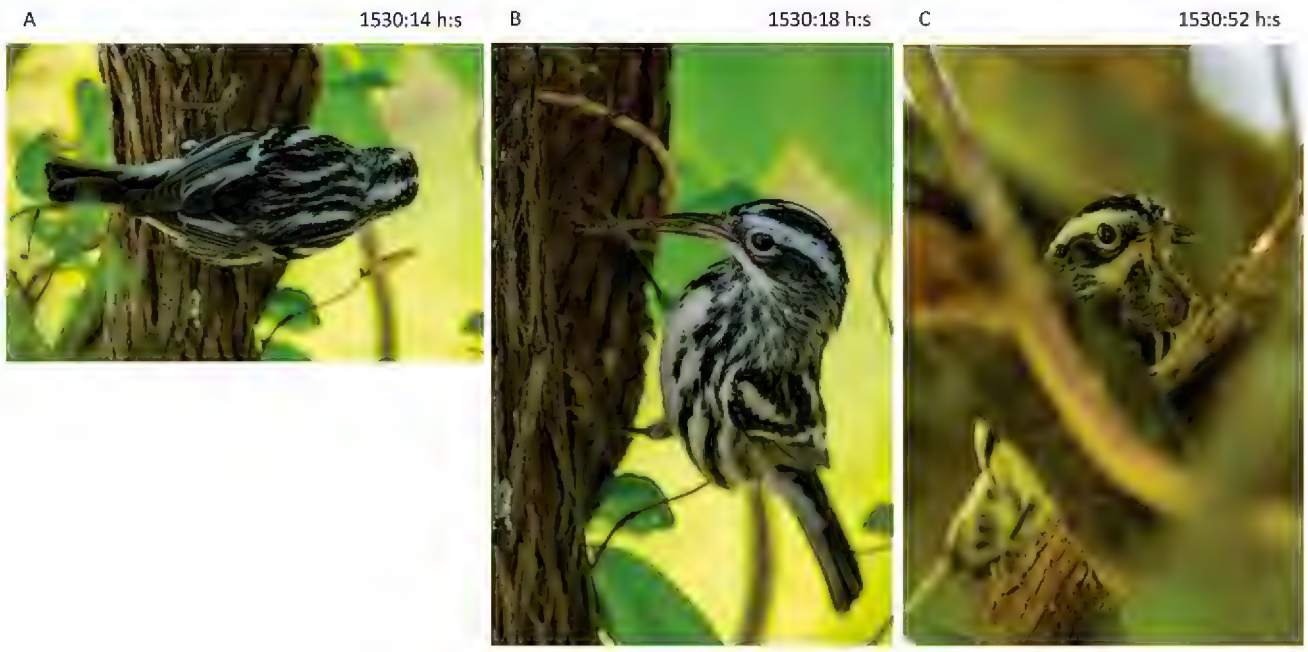

Figure 1. A recorded 38-s feeding bout of a Black-and-white Warbler in the Mason Farm Biological Reserve, Chapel Hill, North Carolina on 25 April 2022. Panel A shows the bird braced in a horizontal position on a vertical vine, panel B shows the bird holding a ~20.9-mm twig positioned lengthwise in its bill immediately above a crevice in the bark of the same vine, and panel C shows the bird on a branch adjacent to the vertical vine holding a caterpillar in its bill.

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that the Black-and-white Warbler gleaned the caterpillar from the surface of the bark rather than using the twig to insert and probe for the caterpillar in a crevice in the bark. The estimated diameter of the caterpillar (~6.5 mm; Fig. 1C) is 2.5 times larger than the width of the largest crevice (~2.6 mm) visible (Fig. 1A). This is based on measuring caterpillar diameter and crevice width (Fig. 1C and 1A, respectively) and comparing these values to mean culmen (12.2 mm) and tail (48.8 mm) length of the Black-and-white Warbler along the Atlantic coast (Kricher 2020).

Whether the Black-and-white Warbler gleaned the caterpillar from the surface or from a crevice in the bark of the vine, we believe these sequential photographs provide highly suggestive evidence for tool use by the Black-and-white Warbler. This indirect evidence for tool use by the Black-and-white Warbler is, as far as we are aware, the first such documentation for a wood-warbler (Parulidae).

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Florida Field Naturalist 50(4):94–99, 2022.

FLORIDA'S FIRST CONFIRMED RECORD OF BULWER'S PETREL (*Bulweria bulwerii*) AND A FIRST FOR THE GULF OF MEXICO

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Procellariiformes are pelagic species infrequently encountered along the coast or nearshore waters of the southeastern United States. A survey of eBird reports of procellariiform seabirds from coastal states shows random nearshore and coastal observations unrelated to adverse weather conditions. However, along the northern Gulf of Mexico coast, sightings are usually during or immediately after the passage of tropical cyclones or other meteorological events producing strong, sustained onshore winds. These weather conditions increase detectability of procellariiform seabirds. Those most frequently reported from the Gulf of Mexico are Cory's (*Calonectris diomedea*), Sooty (*Ardenna grisea*), Audubon's (*Puffinus lherminieri*), and Great (*Ardenna gravis*) shearwaters normally found well offshore and associated with deep water. Procellariiform seabirds have been observed in the three westernmost counties of Northwest Florida with onshore winds in all months of the year, including those months outside of hurricane season (Duncan and Duncan 2018).

Northwest Florida is geographically situated where the huge DeSoto Canyon in the northeastern Gulf of Mexico extends to within 96.5 km of shore. The canyon cuts through the sloping continental shelf at depths >914 m and sends an upwelling of cold, nutrient-rich water toward the surface supporting a rich array of marine life (Frank 2014). Hence, procellariiform seabirds may be more likely to be found close inshore to Northwest Florida, and near shore in adverse weather conditions with onshore winds. For example, as Tropical Storm Isaac dissipated over Louisiana and Mississippi, bringing strong onshore winds on 30 August 2012, 80 shearwaters were tallied from Pensacola Beach, Escambia County, Florida (L. R. Duncan, pers. obs.). This included 30 Audubon's, 1 Cory's, 20 Great, and 30 unidentified shearwaters. Similar conditions occurred on 26 October 2019 as Tropical Storm Olga entered Louisiana with onshore winds about 17–22 knots (20–25 mph) yielding a count

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of 118 Audubon's, 13 Great, and 4 Sooty shearwaters from Pensacola Beach (L. R. Duncan, pers. obs.). During strong onshore winds on 2 February 2022, 25 Sooty Shearwaters and 1 Great Shearwater were observed (L. R. Duncan, pers. obs.).

Bulwer's Petrel (*Bulweria bulwerii*) is a small procellariiform seabird breeding in the archipelagos of the eastern North Atlantic, and Pacific and Indian Oceans. In the Atlantic, it breeds southward from the Azores, Madeira Islands, Desertas Islands, Great Salvage Island, and Canary Island to the Cape Verde Islands (Howell and Zufelt 2019) from mid-May through September (Megyesi and O'Daniel 1997). During the nonbreeding season, they disperse across a broad region of the eastern Atlantic ranging from 40° North to 30° South, or roughly the latitudes of Portugal to South Africa. There is substantial variation among colonies as to the distance they migrate for wintering. Most Bulwer's Petrels winter off the northeastern coast of Brazil (Megyesi and O'Daniel 1997). Ramos et al. (2015) found that on average only the more northernmost subtropical colonies from the Azores, Salvages, and Canary Islands overwintered beyond 20° South in the southern subtropics, while those from tropical colonies remained in the tropics all year, a leapfrog migration first described in small oceanic seabirds.

Few reports and records of Bulwer's have been recorded from the western North Atlantic. Haas (1995) describes 7 sightings between 1969 and 1992, two of which were in Florida waters. On 14 May 1969 Joseph W. Taylor reported a probable Bulwer's Petrel between Key West and the Dry Tortugas. He described a small, all dark petrel with a long wedge-shaped tail and a lighter brownish band across the upper surface of its wings. His description, including size and flight pattern, was convincing to Dr. George E. Watson of the Smithsonian Institution who concurred with the identification (Taylor 1972). J. Christopher Haney and Sam C. Wainright observed a possible Bulwer's Petrel on 1 May 1984 off the northeastern coast of Florida. They described a uniformly dark sooty or blackish-brown bird with a long, attenuated tail and a dark rump. They did not observe two field marks, the band across the upper wing surface or the wedge-shaped tail (Haney and Wainright 1985). Nonetheless, Henry M. Stevenson considered this a valid sighting otherwise well-described (Stevenson and Anderson 1994). Greenlaw et al. (2014) considered these two Florida reports as non-verifiable, potential natural vagrants. North Carolina has one record documented with photographs off Oregon Inlet in August 1998 (LeGrand et al. 1999). Brinkley (2007) observed Virginia's first Bulwer's Petrel among numerous other pelagic species in Chesapeake Bay on 2 September 2006 in the dissipating remains of Tropical Storm Ernesto. Ernesto developed from an easterly wave off the west coast of Africa, traveled west along the northern coast of South America,

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then northward along the east coast of the United States. Brinkley's review listed 22 more sightings (one photographed and one specimen) in eastern North America and the Caribbean. Of these, 13 were from the Caribbean. Two July records from California, 1993 and 1998, are the only other North American records (Brinkley 2007).

On 31 August 2021, an all-dark petrel was found at 0900 hours on Pensacola Beach, Escambia County, Florida, after the passage of feeder bands from Hurricane Ida. The tropical system had formed in the central Caribbean Sea on 26 August then swept northwest over the Cayman Islands, through the Yucatan Channel, and across the central Gulf of Mexico, making landfall on the Louisiana coast on 30 August. The weak and disheveled bird was picked up by an unknown individual, spent the day in a bare cardboard box at a beach bar, and was delivered to the Wildlife Sanctuary of Northwest Florida in Pensacola that afternoon. Dorothy Kaufmann, Director of the sanctuary, then contacted Lucy Duncan for help identifying the bird.

During a detailed, in-person examination, Duncan and Kaufmann noted the bird was dark sooty-brown dorsally and ventrally with paler greater secondary coverts forming a light upper wing band. The rump was dark, and the tail was long and highly graduated (Table 1). The head was large and bulky and the bill was relatively thin. Sex and age were not determined.

With a mass of 63 g, the bird was too large to be a Wilson's (*Oceanites oceanicus*), Leach's (*Hydrobates leucorhous*) or Band-rumped (*H. castro*) storm-petrel whose weights range from 34–42 g (Sibley 2000). Although 63 g is lower than the reported typical mass for Bulwer's Petrel (71–139 g; Megyesi and O'Daniel 1997), it is not unusual for a wrecked seabird to be underweight. Some variants of Leach's have a dark rump, but in addition to the smaller size, Leach's tail is both short and notched. Sooty Shearwater, another dark-colored procellariiform seabird regularly found in the northern Gulf of Mexico following tropical storms, is much larger at 780 g (Sibley 2000). Several dark petrels found in the South

Table 1. Linear measurements and mass of the Bulwer's Petrel from Pensacola Beach, Florida, 31 August 2021.

Measurement	Length or mass
Exposed culmen length	20 mm
Wing chord (not flattened)	183 mm
Wingspan	660 mm
Tail	140 mm
Initial mass	63 g
Release mass	69–70 g
Overall length	250–260 mm

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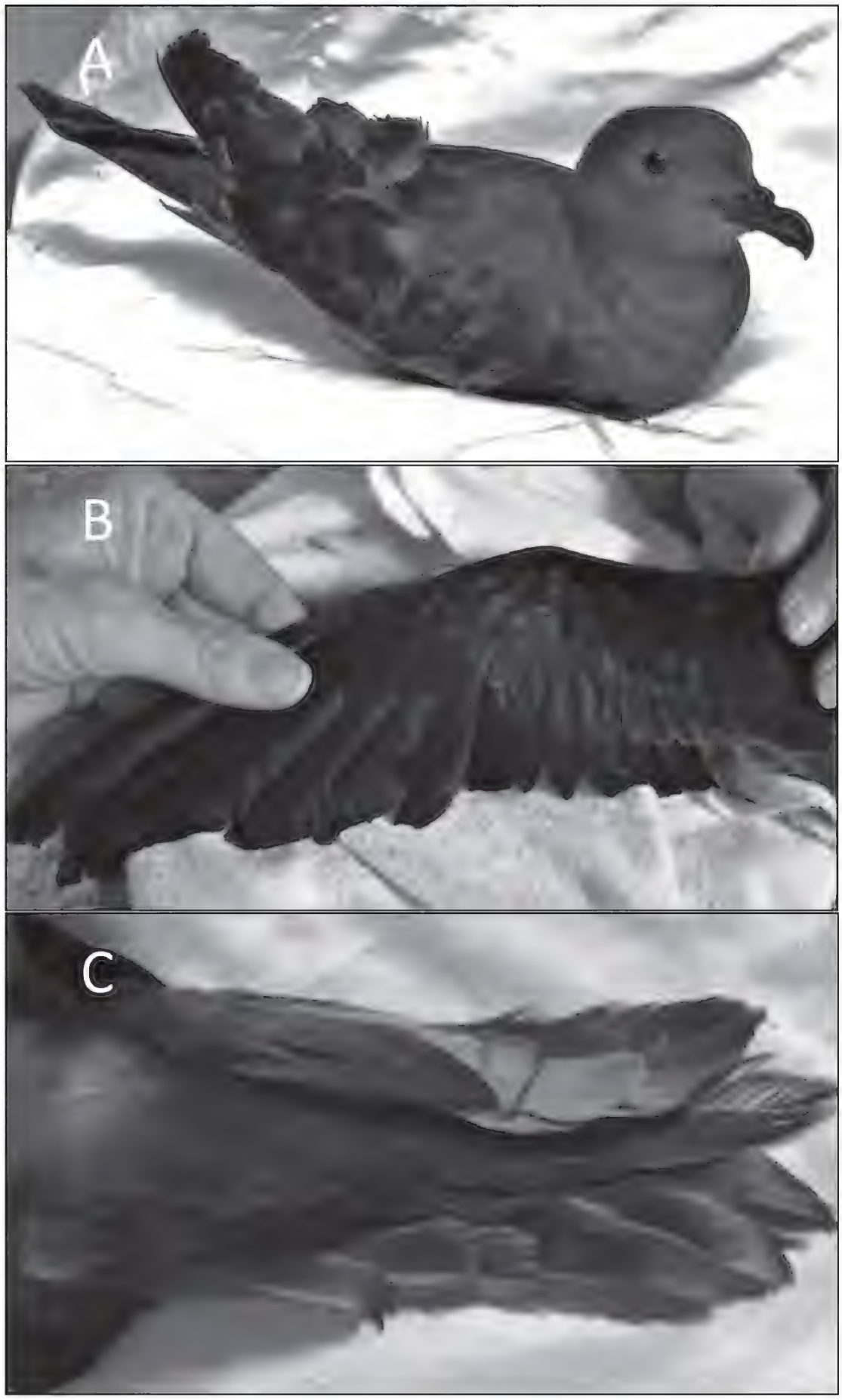

Figure 1. This Bulwer's Petrel (*Bulweria bulwerii*), recovered at Pensacola Beach, Florida on 31 August 2021, was the first confirmed record for Florida and the Gulf of Mexico. Photos taken soon after the bird arrived at the Wildlife Sanctuary of Northwest Florida show several diagnostic features: A) side-view showing the large, bulky head and relatively thin bill, B) extended wing showing the light upper wing band, and C) the long, highly graduated tail.

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Atlantic, Pacific, and Indian Oceans were also eliminated because of their substantially larger size and because of the tail shape, lack of the light upper wing band, and comparatively thin bill. After consulting Dr. Andrew Kratter, Ornithology Collections Manager at the Florida Museum of Natural History (FMNH), identification was narrowed down to Swinhoe's Storm-Petrel (*Hydrobates monorhis*) and Bulwer's Petrel, two dark-colored procellariiform seabirds with a light upper wing band. We then consulted Kate Sutherland of Seabirding (Hatteras, NC). After examining photographs, she observed that the unidentified bird lacked the short notched tail and white feather shafts visible on the primaries beyond the coverts of Swinhoe's Storm-Petrel. In sum, all features of the bird matched Bulwer's Petrel as described and pictured in Harrison (1983), Howell and Zufelt (2019), and Megyesi and O'Daniel (1997).

The bird was rehabilitated at the sanctuary for five days and released at 69–70 g in a healthy condition on 4 September 2021 near the mouth of Pensacola Bay. The bird flew vigorously upward in large circles to gain altitude and possibly get its bearings, then flew southward toward the Gulf of Mexico. Before disappearing from sight, the petrel dipped down touching the water briefly, then regained altitude and continued south over the open Gulf. Several feathers remained in the carrying cage upon release, and we delivered these to Dr. Kratter at the FMNH.

Prior to this record, the closest documented occurrence to the Gulf of Mexico of Bulwer's Petrel was along the central west coast of Cozumel, Mexico (20.4757, –86.9756) on the Caribbean Sea on 27 October 2017 (Chacón 2017) when one was recovered after colliding with a building. The eBird checklist includes one photo of the bird in hand (Chacón 2017). A review of ornithological society records committee checklists from Texas, Louisiana, Mississippi, Alabama, and Florida, all bordering the Gulf of Mexico, revealed no prior reports of Bulwer's Petrel. The Pensacola Beach record is reported on eBird by Robert Duncan on 4 September 2021 (Duncan 2021). Eleven photographs are archived at the FMNH (2021-1592 BUPE).

Based on the above documentation, photographs, and feathers deposited with the University of Florida Museum of Natural History, the Florida Ornithological Society Records Committee voted to accept Bulwer's Petrel on the Official List of Florida birds (FOSRC #UF54794; Kratter 2022).

Acknowledgments

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THIRTIETH REPORT OF THE FLORIDA ORNITHOLOGICAL SOCIETY RECORDS COMMITTEE: 2019–2021

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This thirtieth report of the Florida Ornithological Society Records Committee (FOSRC) summarizes decisions made by the committee at meetings held in November 2020 and December 2021. Committee activity and operations are guided by our Rules and Procedures, available from the author. The FOSRC routinely evaluates reports of bird species on the FOSRC Review List (20 or fewer accepted records or reports over the previous 10 years) and reports of species occurring for the first (known) time in the state. On occasion, when we receive a recommendation, we also consider whether an exotic species meets our criteria for establishment in Florida. Reference here to the Committee refers to FOSRC.

Because of restrictions on travel and face-to-face contact resulting from the COVID-19 pandemic, both the 2020 and 2021 FOSRC meetings were held by Zoom. Across these two years, we reviewed 180 new reports; in addition, we reviewed two submissions tabled at our 2019 meeting, reassessed three submissions unresolved from that meeting, and reopened one submission from 2019 with the receipt of new expert opinion. Documentation supporting the 186 total submissions included photographs (156 submissions), video recordings (1 submission), audio recordings (3 submissions), specimens deposited in museum collections (five submissions), written descriptions (19 submissions), and two published reports on whether an exotic species met criteria to be considered established in the State. Of these 186 reports, 151 (81.1%) were accepted, 28 were not accepted (15.1%), and seven were unresolved (3.7%). These percentages are similar to those in other recent FOSRC reports (Kratter 2019, 2020). Not surprisingly, the rate of acceptance was much lower for 28 submissions that lacked supporting photographic, audio, or specimen evidence (26.3% accepted, 73.7% not accepted) than for those with such evidence (87% accepted, 8.3% not accepted, 4.2% unresolved or tabled). Part of this is attributable to misidentifications or poorly detailed reports submitted by beginning birders.

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The submissions included an astonishing 18 species that would have been new additions to the Official List of Florida bird species, and ten of these were accepted, bringing the State List to 538 species. The ten species added to the Official List were Common Murre, Mitred Parakeet, Pacific-slope Flycatcher, European Robin, Eastern Yellow Wagtail, Hermit Warbler, and Scott's Oriole in 2020, and Gray-tailed Tattler, Bulwer's Petrel, and Wedge-tailed Shearwater in 2021. Pacific-slope Flycatcher replaces "Western" Flycatcher, which had been previously accepted to the species pair Pacific-slope/Cordilleran Flycatcher. Five potentially new species to the State were not accepted: Yellow-legged Gull and Gila Woodpecker in 2020, and Cape Verde Shearwater, Western Reef-Heron, and Phainopepla in 2021. The other three potentially new species for Florida were unresolved or tabled (Great White Pelican, House Crow, Whooper Swan).

Committee News, Formats, and Terminology

Committee news.— This report was prepared on behalf of all members of the FOSRC serving during the 2019–2021 reporting years. The members and their year of term expiration on the FOSRC were Andy Kratter (2020), Mark Berney (2021), Elliot Schunke (2022), Michelle Davis (2023), John Murphy (2024) who passed away in 2020 and was replaced by Jeff O'Connell, Michael Brothers (2025), Mitchell Harris (2026), and Larry Manfredi (2027). Andy Kratter served as non-voting Secretary in the year following cycling off as a voting member of the Committee. See the FOS website (above) for a list of the current members of the FOSRC and their addresses.

Because of the Coronavirus pandemic, both the 2020 meeting and the 2021 meeting were conducted in conference calls on Zoom. During 2020, the FOSRC met three times in November. During 2021, the FOSRC met three times in December .

Although the Committee still does not receive submissions for some records or reports of Review List species that are posted to online sites (e.g., various Facebook pages) or to eBird, the percentage of those that are being submitted has increased this year (see Kratter 2018b).

Formats and terminology.—We followed the current nomenclature and sequence that are used in the American Ornithological Society (formerly American Ornithologists' Union) check-list (AOU 1998) and its supplements through July 2022 (https://americanornithology.org/publications/north-and-middle-american-checklist/) in the species accounts. Within accounts with more than one submission on a species, each report is introduced sequentially by catalog number. The initials following the catalog number refer to one or more contributors who supplied information to the committee on accepted reports (see

list below). We employ the terminology for age of birds outlined by Kratter (2012a). We normally do not review subspecies, but we have accepted submissions on distinctive, field-identifiable subspecies, especially those whose taxonomic rank may be reevaluated by the American Ornithological Society's North American Classification Committee in the future. Our use of the words "report" and "record" to describe occurrences of species in Florida follow Robertson and Woolfenden (1992), a distinction that has been followed by subsequent major reviews of the Florida avifauna, and by the Field Observation Committee of the FOS. Individual occurrences that are independently verifiable (specimen, diagnostic photograph, or an audio or video file) are characterized as records, and if not verifiable as reports. Accepted reports are special only in the sense that the non-verifiable documentation is deemed to be fully supportive of the identification and the circumstances do not warrant special consideration. In past practice, the Committee has only accepted records (i.e., with verifiable evidence) for addition of a species to the Florida List. After that initial hurdle has been met, reports are considered based on available physical evidence and circumstance (provenance not an issue). For each species, I provide a review of the status of the species in Florida chiefly based on FOSRC data through the end of this reporting period (Dec 2021), as specified.

Abbreviations used here in the species accounts are ABA (American Birding Association), AOS (American Ornithological Society), FLMNH (Florida Museum of Natural History), FOSRC (Florida Ornithological Society Records Committee), NP (National Park), NWR (National Wildlife Refuge), and SP (State Park).

Submitters (only accepted reports are individually listed with given abbreviations): Angel Abreu (AAb), Audrey Albrecht (Aal), Mario V. Balitbit (MVB), Fred Basset (FB), Susan Beaudoin (SuB) ,Joan Becker (JBe), Mark Berney (MBe), Patrick J. Blake , Shirley Bobier (ShB), Dave Bowman (DBo), James Brookman (JBr), Michael Brothers (MBr), Paul Budde (PB), Brenda and Jerry Callaway (BJC), Wayne Caswell (WCa), Jim Cavanaugh, Will Chatfield-Taylor (WCT), JoAnna N Clayton (JCl), Kathleen Coates, Sheri Cook, Rangel Diaz (RaD), Rachel DiPietro (RDi), Robert Duncan (RoD), Kelly Ducham (KDu), Lucy Duncan (LD), Mary Dunning (MDu), Diane Durham (DD), Andrew Durso (AD), Jim Eager (JE), George Eschenbach (GE), Susan Epps (SE),Charlie Ewell (CE), Steven B. Feldstein (SBF), Pete Fenner (PF), Christopher Ferro, Sean Fitzgerald (SF), Hugh David Fleischmann (HDF), Judi Floyd (JF), Natasza Fontaine (NFo) David W. Foster (DWF), Noah Frade (NFr), Rafael Galvez (RGa), Luis Gles (LGl), Nancy Glickman (NG), Marcello Gomes (MGo), Gabriel Gonzalez, Luis Gonzalez (LGo), David Goodwin (DG), Hans Gonzembach (HGo), Jeff Graham (JeG), Tedd Greenwald (TGr). John Groskopf (JoG), Robert Gundy (RGu), Jacquelyn Guzy (JGu), Tim Hardin (TH), Paul Harvey (PaH), Peter Hawrylyshyn (PeH), Alberto Hernandez (AHe), Hansel Herrera (HHe), Claire Herzog (CHe), Alan Hoffman (AHo), Paul Hueber Adam Hull ((PHu), AHu), Will Johnson (WJo), Matthew Jolley (MJo), Stephen Kaplan (SKa). Susan Killeen (SK), Adam Kent (AKe).

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Aaron Kirk (AKi), Billie Knight (BKn), Marc Kramer (MKr), Andrew W. Kratter (AWK), Keith Laakkonen (KL), Robert Landry, Bob Lane, Sherry Lee Lane (SLL) Pat Leary (PL), Janet Leavens (JLe), Thomas Ledford (TLe), Larry Manfredi (LaM), Amy Marques, Kyle Matera (KMa), Luis A Matheus (LAM), Lori Mathis (LoM), Francis McKeen, Shelby McNemar (SM), David McQuade (DMQ) Tammy McQuade (TMQ) John F. Milio (JFM), Joseph Montes de Oca (JMO), Yve Morrell (YM), John Murphy (JMu), Lori O'Bar (LOB), Mike Ostrowski (MO), Jose Padilla-Lopez (JPL), William J. Phelan, Cheri Phillips (CPh), Bryce Pierce, Peter Plage (PPl), Matthew Press (MPr). Bill Pranty (BPr), Sandy Reed (SRe), Michelle Reyes (MRe), Wayne Richardson (WR), Tom Riggs (TRi), Janice G Rinehart (JGR), Dotty Robbins (Dro), Meg Rousher (MRo), Carlos Sanchez (CS), Jen Scoby (JS), Mark Seganish (MSe), Karen Seward (KSe), Alexander Sharp (ASh), Heather Shirley (HSh), Bob Showler (BSh), Gael Silverblatt (GSi), David Simpson (DSi), Morgan Slevin (MSl), Ron Smith (RSm), Robert Snow, Valerie Sparling (VSp), Lynette Spence (LSp), Ken Spilios (KSp), Karen Stanmore (KSt), Richard and Sharon Stilwell (RSS), Iliana and Steve Stokes, Malcolm Mark Swan (MMS), Roberto Torres (RT),Ken Tracey (KTr), Bob Wallace, Eary Warren (EW), Hugh Whelan (HWh), Bryan White (BWh), Graham Williams (GW), Kylie Wilson, Adam Zions (AZ).

Submissions Accepted

White-cheeked Pintail, *Anas bahamensis*

2020-1458 (PB, MR, SF). This bird was first reported 29 December 2019 by Hugh McGuiness at Lely Resort, southeast of Naples along US-41 (Collier County). It was seen by many birders and present until 8 February 2020. Steven B. Feldstein submitted weather maps and diagrams to the FOSRC that show winds were favorable on 26–27 December to push vagrants westward from the Bahamas to south Florida.

This species is common in captivity, so it is often difficult to separate wild strays from birds escaped or released from captivity. Previously accepted birds have shown wild-type behaviors (skittish, wary of humans), have been seasonally appropriate for strays, and have occurred at sites typical for natural populations of waterfowl. Four previous submissions have been accepted by the FOSRC (two from Miami-Dade County, Indian River County, and Brevard County).

Least Grebe, *Tachybaptus dominicus*

2021-1567 (CS). Carlos Sanchez found this bird on 7 March 2021 in Crandon Gardens on Key Biscayne (Miami Dade County); it was present and seen by dozens until 2 July 2021. What is presumably the same bird reappeared in December 2021–April 2022, but those observations will be assessed in our next report.

This species breeds commonly in the Bahamas and Cuba. The FOSRC has accepted three previous submissions: two from Palm Beach County in 2008 and 2017, the former including a pair that bred (Hasse and Hasse 2009), and one from Collier County (1990). A 1988 record in Monroe County has not been assessed by the FOSRC (Greenlaw et al. 2014).

Red-necked Grebe, *Podiceps grisegena*

2021-1544 (DWF, JeG). Jeff Graham found and photographed this bird on 5 December 2020 on urban Wells Lake in Orange Park (Clay County). It was present until 31 January 2021 and seen and photographed by many.

Red-necked Grebe is a casual winter visitor to Florida (Greenlaw et al. 2014). The FOSRC has previously accepted eight submissions, all from Volusia and Pasco counties north.

Scaly-naped Pigeon, *Patagioenas squamosa*

2020-1453 (AKi, DmQ). On 14 December 2019, Aaron Kirk photographed a strange pigeon at his home on Sanibel Island (Lee County) that he thought may be Red-billed Pigeon (*P. flavirostris*), a Middle American species that barely makes it into south Texas. He shared his photos with local birders David and Tammy McQuade who recognized that it was a Scaly-necked Pigeon. They visited on the 16 December and heard the bird, and then early on 17 December were able to get excellent photographs. Concerned about the possibility that the bird had escaped from a nearby aviary that has many tropical species, the McQuades questioned the owners and learned that the aviary did not have any Scaly-necked Pigeons. In addition, the photographs revealed that the bird showed no signs at all of feather wear or other signs of recent captivity.

This is the first Florida and the ABA Area record of this widespread Caribbean species since specimens were collected in Key West (Monroe County) in 1898 (Atkins 1899) and 1929 (Chapman 1931).

Inca Dove, *Columbina inca*

2021-1581 (GA). This bird was first seen by Gianna Acurri on 16 June 2021 coming to a bird feeder at an apartment complex in Gainesville (Alachua County). It was photographed the next day but was not seen again.

This record continues the range expansion of Inca Dove populations in northern Florida (Kratter 2018a,b; 2019). The first Inca Dove in Florida was photographed in September 2011 in Franklin County (Greenlaw et al. 2014). Seven additional records in north Florida from the Panhandle east to Duval County have been accepted since: birds in Santa Rosa County in October 2011, May 2017, and May 2019; one photographed in February 2012 in Duval County; and birds photographed in May 2015, June 2017, and September 2018 in Escambia County. This is the first accepted record from the Florida Peninsula.

Zenaida Dove, *Zenaida aurita*

2021-1602 (RGa). This dove was first found and photographed by Rafael Galvez and Luis Gles in a restricted part of Long Key State Park in the Middle Keys (Monroe County) on 13 October 2021. Eventually it visited areas open to the public in the park and was seen by many during its long stay until 26 February 2022.

Previous occurrences in Florida include seven records from Florida Keys (Windley Key, Feb–Apr 1996; Sugarloaf Key, Nov 2001; Key Largo, Jun 1988, May 2002, and Jun 2009; Bahia Honda, Feb. 2010; and Long Key, Feb–May 2016) and two accepted records from Miami-Dade County (Key Biscayne, Oct 2004 and Miami Executive Airport Jul–Aug 2019) Two undated pre-1900 specimens from Florida have not been assessed by the FOSRC but were accepted by Robertson and Woolfenden (1992) and Greenlaw et al. (2014).

Vaux's Swift, *Chaetura vauxi*

2021-1570 (NFo, RGu). Three individuals were seen, photographed, and audio recorded from 13 January to 7 February 2021 at Miller Landing on Lake Jackson (Leon County).

Previous records accepted by the FOSRC of this species that breeds in western North America include six that were audio-recorded in Gainesville in 1993 (Webber and Collins 1995), and a single bird in Apalachicola (Franklin

County) that was captured and measured in January 1996 and December 1997 (McNair and Lewis 1997, 1998). The latter locale had a flock of as many as 49 birds the previous winter (Nov 1994–21 Apr 1995), but those were not audio recorded (McNair and Lewis 1997). More recently, a flock persisted over three winters (2015–2018) in Gainesville (Alachua County), roosting in the same chimney each night on the University of Florida campus. Florida still lacks any documentation that Chimney Swifts (*C. pelagica*) winter in the State, and until documentation is forthcoming it should be assumed that wintering *Chaetura* swifts in Florida are Vaux's.

Antillean Palm-Swift, *Tachornis phoenicobia*

2020-1440 (LaM). Luis Gles found this swift at the Sombrero Golf Course on Marathon Key (Monroe County) on 30 September 2019. This is likely the same bird that was at Grassy Key (~14 km to ENE) in July 2019 (FOSRC #2019-1425; Kratter 2019). The bird frequented this location until 31 December 2019.

2020-1460 (AD). Andrew Durso and Kendal Morris spotted this bird on 5 January 2020 at Billy Creek Preserve (26.662041, –81.822508) in Lee County. The description included the long thin wings, long tail, white sides of rump, grayish underparts, and erratic flittering flight style. They had recently seen African Palm-Swifts (*Cypsiurus parvus*) in Namibia and commented on similarities in flight behavior.

Aside from these three recent records, the only previous record of Antillean Palm-Swift in Florida was two birds photographed in Key West during their stay 7 July–13 August 1972 (*American Birds* 26:851, 1972; Greenlaw et al. 2014). The species is resident in Cuba, Hispaniola, and Jamaica (AOU 1998) and is occasionally recorded in Puerto Rico (eBird).

Calliope Hummingbird, *Selasphorus calliope*

2021-1554 (TH). Bubba Scales found this female visiting hummingbird feeders and feeding at flowers in his and his neighbors' suburban gardens in Gainesville (Alachua County) on 6 January 2021. The bird stayed for several weeks, and birders were able to get abundant photographs and video and audio documentation. It was last seen 30 January.

This is the fourteenth record accepted by the FOSRC of this breeder from mountains in western North America. All but one of these were in Florida's Panhandle; the lone other peninsular record (FOSRC #1996-363) was a bird banded in Polk County in March 1996 (Bowman 2000).

Allen's Hummingbird, *Selasphorus alleni*

2020-1475 (FB). This second-year male was found by Teresa Nooney on 25 January 2020 at her home in Callaway (Bay County). It was caught, photographed, and banded by hummingbird bander Fred Basset.

This is the twelfth record accepted of this far western hummingbird species by the FOSRC. Eleven of these were in Florida's Panhandle; the others were Florida's first record, an adult male in the winter of 1996 in Alachua County that was caught and banded (FOSRC #1997-380; Bowman 2000), and another adult male (FOSRC #2009-715) photographed in Lakeland (Polk County) February 2009 (Kratter 2010b).

Pacific Golden-Plover, *Pluvialis fulva*

2020-1467 (WCT), Richard Crossley found, photographed, and took video of this after-second-year bird in the agricultural fields (26.655073, –80.4652868)

of Palm Beach County on 16 January 2020. It was seen off and on through 23 March (eBird checklists), during which it had begun to molt into alternate plumage.

2021-1584 (JOC). This adult was found, photographed, and audio-recorded by Jeff O'Connell and Kathleen Coates on 3 August 2021 at Faulk Drive landing at Lake Jackson (Leon County). It was not relocated.

These are just the second and third records of Pacific Golden Plover in Florida. The first was also in Palm Beach County, found by Corey Callahan on 9 April 2015 and seen until 14 April (FOSRC #2016-1124; Kratter 2018b). This extreme long-distant migrant breeds on tundra in eastern Asia, Alaska, and western Canada and largely winters on islands and Australia in the South Pacific. It is a vagrant to eastern North America, mostly to the Atlantic provinces of Canada and in the northeast United States south to North Carolina (eBird).

Bar-tailed Godwit, *Limosa lapponica*

2020-1441 (WR). This adult in basic plumage was discovered and photographed by Wayne Richardson at Tigertail Beach (Collier County) on 25 September 2019. It was seen by many during its stay until 5 October 2019.

Both subspecies of Bar-tailed Godwit have previously been recorded in Florida: the European breeder *L. l. lapponicus* in Pinellas in September 1985 (FOSRC #1986-099; Greenlaw et al. 2014), in October 2014 (FOSRC #2014-996; Greenlaw 2016a), and again in October 2016 (FOSRC #2016-1182; Kratter 2018b), and the Asian and Alaskan breeder *L. l. baueri* in Monroe County in April 2010 (FOSRC #2010-803; Kratter 2012a). The FOSRC has also accepted sight reports from Franklin, Wakulla, and Monroe counties. The heavily barred rump and lower back of the Collier County bird indicate it is from the Siberian or western Alaskan populations that are renowned for their world-record non-stop migration flights often topping 5,000 km (https://www.audubon.org/news/these-mighty-shorebirds-keep-breaking-flight-records-and-you-can-follow-along).

Hudsonian Godwit, *Limosa haemastica*

2020-1436 (PL). Pat Leary found and photographed this bird on Corrigan's Reef in Levy County (east of Cedar Key) on 16 September 2020.

2020-1522 (LG). Luis Gles photographed this juvenile on 15 September 2020 at Curry Hammock State Park (Monroe County).

2020-1513 (RGu, NFO). This molting adult was found and photographed by Robert Gundy and Natasza Fontaine on 17 August 2020 at Anastasia State Beach (St. Johns County).

2020-1465 (GE). This sight report was submitted by George Eschenbach from an observation made 9 November 2019 on Oil Well Road in Collier County (northeast of Naples). The description was diagnostic for Hudsonian Godwit, including large size, upturned bill, black underwings, and white wing stripe.

2020-1506 (WCT). This bird, mostly in basic or juvenile plumage, was found and photographed by Will Chatfield-Taylor on 23 May 2020 at Merritt Island NWR (Brevard County).

This species was added to the Review List in 2016. Single records were accepted in 2017 and 2018 (Kratter 2018b, 2019), and two were accepted in 2019 (Kratter 2020). In total, the FOSRC has accepted nine submissions over five years, barely less than the drop-off criterion of two per year for inclusion on the FOSRC Review List. There are also six documented records of this species on eBird during this period that were not submitted to the FOSRC.

Ruff, *Calidris pugnax*

2020-1459 (AZ). Adam Zions found and photographed this bird on 2 January 2020 at the Brookridge Water Treatment Plant in Hernando County. Observed until 25 February, it was seen by scores of birders.

2020-1470 (RG, SM). Carl Edwards discovered this bird on 19 January 2020 at the Sem-Chi Rice Mill fields in Palm Beach County. It was seen and photographed by a few other birders that day.

This species was added to the Review List in 2016. Three records were accepted in 2016 (Kratter 2018a), one in 2017 (Kratter 2018b), and four in 2018 (Kratter 2019). Including the 2020 records, the FOSRC has accepted ten records over the past five years, right at the drop-off criterion of two per year for inclusion on the FOSRC Review List. There are also about ten documented records of this species on eBird during this period that were not submitted to the FOSRC.

Gray-tailed Tattler, *Tringa brevipes*

2021-1599 (JBr, WTC, DG, BP). James Brookman found and photographed this bird at Harry Harris County Park on Tavernier Key (Monroe County) on 26 October 2021. He initially reported it on eBird as a Wandering Tattler (*T. incanus*), which would have been a first State record. After photographs were sent to West Coast shorebird experts, it was thought that it was more likely a Gray-tailed Tattler, the East Asian sister species of Wandering. The bird persisted at the same location, and eventually its vocalizations were audio recorded by Will Chatfield-Taylor and Mark Berney, confirming Gray-tailed Tattler. Discussion of this bird's identification can be found on Facebook groups Florida Rarities and Bird Migration (https://www.facebook.com/groups/1252341111448152/search/?q=tattler) and ABA Rare Bird Alert (https://www.facebook.com/groups/444762565584392/search/?q=tattler).

This extraordinary find is the first Florida record of this long-distant migrant, which breeds in East Asia and winters mostly in the South Pacific and Indian oceans. It is somewhat regular in Hawaii and far western Alaska but extremely rare elsewhere in North America, with records in British Columbia, California, Maine, and Massachusetts (eBird).

South Polar Skua, *Stercorarius maccormicki*

2020-1512 (NFO, RGu). This bird was first spotted in Alabama by Olivia Morpeth and Sabrina Cobb at Gulf State Park Shores in Alabama, where it was present on 30–31 July 2021. This was about 20 km west of the Florida State Line. On 2 August, what was certainly the same bird was found by Natasza Fontaine and Robert Gundy in Florida at Perdido Key State Park (Escambia County). It was present on both sides of the Florida–Alabama border until 10 August, when it drifted eastwards, being seen in Santa Rosa and then Okaloosa counties, and eventually last being recorded at St. Andrews State Park in Panama City (Bay County) on 30 August 2020.

The South Polar Skua is considered a casual vagrant to Florida (Greenlaw et al. 2014) with only seven previously accepted records (FOSRC #1984-024, Brevard County, Sep 1982; FOSRC #1993-275, Brevard County, Oct 1993; FOSRC #1998-394, Volusia County, Nov 1998; FOSRC #1998-395, Nassau County, Oct 1998; FOSRC #2000-414, Palm Beach County, Dec 1998; FOSRC #2014-1026, specimen from Palm Beach County, May 2014, FOSRC #18-1268, Collier County, Aug 2018) and two sight reports (FOSRC #1994-319, Volusia County, Oct 1994; FOSRC #2009-742, Volusia County, May 2009, both accepted to skua species). The species is much more regular off North Carolina (eBird records), where pelagic trips are much more frequent.

Long-tailed Jaeger, *Stercorarius longicaudus*

2020-1517 (SF). This sight report detailed an observation by Sean Fitzgerald of an adult light morph on 23 August 2020 at Ocean Bay Natural Area in St. Lucie County. The description included the size relative to Sandwich (*Thalasseus sandvicensis*) and Royal terns (*T. maximus*), long central rectrices, two white outer primary shafts, two-tone wings with darker primaries and primary coverts, and pale secondary coverts and mantle.

This species was added to the Review List in 2016. One record was accepted in 2016 (Kratter 2018a), four records were accepted in 2017 (Kratter 2018b), one record was accepted in 2018 (Kratter 2019), and three records were accepted in 2019 (Kratter 2020). Many recent unsubmitted reports and a few records are listed on eBird. Because of identification difficulties, we prefer to maintain it on the Review List. Greenlaw et al. (2014) listed it as a very rare to rare transient and apparent winter visitor.

Common Murre, *Uria aalge*

2020-1462 (JS, PF). This winter-plumaged bird was found and photographed on 7 January 2020 by Jen Scoby and Pete Fenner at the Lighthouse Point Park jettying Ponce Inlet (Volusia County). Despite concerted efforts over the next several weeks, the bird was never relocated. The photographs show the expansive white face, dark line through the eye, and small bill that distinguish Common Murre from Thick-billed Murre (*U. lomvia*).

This is the first record for Florida of this northern alcid species, and the first record south of North Carolina on the Atlantic Coast (eBird). In the North Atlantic, the Common Murre breeds mainly on islands off eastern Canada (south to Newfoundland and occasionally Nova Scotia). It winters regularly south to Cape Cod (Massachusetts), then irregularly or rarely south to Virginia, with a few records off the outer banks of North Carolina (eBird).

Thick-billed Murre, *Uria lomvia*

2021-1596 (AWK). This bird washed ashore at Jetty Park in Cocoa Beach (Brevard County) on 7 November 2020. It had a wound to the torso and was brought to the Florida Wildlife Hospital for care but died before it arrived. The carcass was donated to the FLMNH, where a skin and partial skeleton was prepared (UF 54134).

The FOSRC has previously accepted seven records of Thick-billed Murre, four specimens and three photographed. Including this record, all are from the winter (7 Nov–20 Jan) on the Atlantic Coast between Duval County and Palm Beach County.

Razorbill, *Alca torda*

2021-1542 (SLL). This bird, apparently an after-hatch-year, was photographed by Sherry Lee Lane in the surf at Apollo Beach parking lot #5 at Canaveral National Seashore (Volusia County) on 24 November 2020.

2021-1569 (JBe). This after-second-year bird was found dead on the beach at Guana Tolomato Matanzas National Estuarine Research Reserve on 16 April 2021; it was photographed by Joan Becker.

For most of the past ten years, Florida has averaged a little bit more than one Razorbill record per year (FOSRC records). Most of these have been birds that have washed up on beaches and brought to wildlife rehabilitation hospitals on the north Atlantic Coast south to Brevard County. However, the winter of 2012–2013 saw a huge influx likely involving thousands of these alcids, with many birds reaching the Gulf Coast, all the way northwest to Pensacola, with one bird making it to Louisiana (Diamond et al. 2020).

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Dovekie, *Alle alle*

2021-1562 (SK). This bird was found by Susan Killeen washed up dead on the beach at Anastasia State Park (St. Johns County) on 25 March 2021.

2021-1571 (AWK). This bird was found washed ashore at Flagler Beach (Flagler County) on 11 November 2021. It had a broken humerus and was brought to the Marine Science Center for care but died before it arrived. The carcass was donated to the FLMNH, where a study skin was prepared (UF 54104).

This species was added to the Review List in 2016 and these are the first records submitted since. This small alcid is a sporadic to irregular visitor to Florida, although large numbers occasionally visited prior to the 1980s (FLMNH specimens; Greenlaw et al. 2014). Only one other record is listed on eBird since 2010: a bird off Apollo Beach on Cape Canaveral on 18 January 2021 (https://ebird.org/checklist/S80061289); it has not been submitted to the FOSRC. The species regularly winters south to the Outer Banks of North Carolina, and occasionally to northern South Carolina.

Sabine's Gull, *Xema sabini*

2020-1437 (MO). On 19 September 2019, Mike Owtrowski photographed this first-cycle gull flying off Siesta Key Beach (Sarasota County).

2021-1543 (JE). This first-cycle gull, found by Dan Lee at Jetty Park in Cocoa Beach (Brevard County) on 21 November 2020, was seen by many during its weeklong stay. Documentation was provided by Jim Eager.

This species was added to the Review List in 2016. Two records and two sight reports were accepted in 2017 (Kratter 2018b), one record was accepted in 2018 (Kratter 2019), and three were accepted in 2019 (Kratter 2020). Greenlaw et al. (2014) considered it an irregular, rare fall and occasional spring visitor. It also appears to be an occasional winter visitor, indicated by the Brevard–Indian River County report in 2017 (Kratter 2018b) and two sight reports in January from Volusia County (eBird), and an occasional summer visitor (Kratter 2018b). A number of recent sight reports and a few records have not been submitted to the FOSRC, including at least ten during the period covered by this report, indicating that this species occurs at a rate greater than the 2 records per year cut-off to be included on the Review List.

Black-headed Gull, *Chroicocephalus ridibundus*

2020-1471 (PeH). This first-cycle bird was beautifully photographed at Bowditch Point Park at Fort Myers Beach (Lee County) on 25 January 2020 by Peter Hawrylyshyn.

2020-1477 (NFO, RGu). This first-cycle bird was initially reported by Murray Cragin at the Okaloosa Holding Ponds (30.4742, –86.6236; Okaloosa County) on 26 January 2021 (https://ebird.org/checklist/S64729099) but not identified. It was found again by Malcolm Mark Swan on 6 February, and it stayed until 18 February.

This species is a very rare winter transient and winter visitor to the state (Greenlaw et al. 2014). Including these two records, the FOSRC has accepted 16 records and one sight report of this Old World gull. The report from Okaloosa County is only the third record from the Panhandle.

Heermann's Gull, *Larus heermanni*

2020-1433 (GW, JFM). This first-cycle bird, which wandered up and down the Atlantic Coast until June 2020, was first found and photographed by Graham Williams at Indiatlantic Beach (Brevard County). It was also recorded in Miami-Dade, Palm Beach, St. Johns, Duval, and Nassau counties.

2021-1536 (JoG). On 21 October 2020, John Groskopf photographed this second-cycle gull, almost certainly the same individual as the above bird, at North Jetty Beach Park (Sarasota County). In December 2020 it was found on the Atlantic Coast in Volusia County, and then in Miami-Dade County, and in January 2021 it was seen in Palm Beach County, and then in Volusia County. In March 2021 it was found in Georgia, then in May it was found in Virginia, then Rhode Island, then New Jersey in May and June. It returned south again in fall 2021, being recorded in August and September in Duval County and ranged north to Georgia (Oct) and Virginia (Nov 2021).

Florida has only one previous record of Heermann's Gull: a bird discovered as a first-cycle bird on 24 October 2000 in Pinellas County and seen along the Gulf Coast of Florida north to Okaloosa County and south to Lee County until June 2005 (FOSRC #2001-452; Bowman 2004, Greenlaw et al. 2014). This Pacific Coast species breeds mostly on one island in the Sea of Cortez in northwest Mexico; a few breed north into central California. Most of the population moves north in the nonbreeding season to coastal California (rarely north to British Colombia); some move south to central Mexico (rarely to Guatemala).

California Gull, *Larus californicus*

2020-1464 (MO, JF). This winter plumaged adult was found and photographed by Mike Ostrowski at Siesta Key Beach (Sarasota County) on 12 January 2020 and stayed until 23 February.

2021-1574 (JoG). John Groskopf found and photographed this winter plumaged adult at Siesta Key (Sarasota County) on 20 February 2021; it stayed until 23 February.

These are the seventeenth and eighteenth accepted records from Florida for this western North American species, where it is an irregular, rare winter visitor to the Panhandle south to the central coast of the peninsula (Greenlaw et al. 2014).

Slaty-backed Gull, *Larus schistisagus*

2021-1605 (BC, JC). Brenda and Jerry Callaway found and photographed this adult or near adult gull at Fort Pickens State Park (Escambia County) on 16 November 2021. Consultation with gull experts quickly identified the gull based on very dark gray back, deep bill with bulbous tip, broad white skirt on the secondaries, bright pinks legs, pale eye, white tongues and mirrors in the tips of primaries 5–8 (known as "string of pearls"). Unfortunately it was not relocated.

This is the second record for Florida of this East Asian species. The first (FOSRC #2003-509; Bowman 2006) was at the complete opposite end of Florida: an adult 20 June–18 July 2003 at Key West. The only other documented record in the southeastern United States was an adult in January 2022 in South Carolina (https://www.carolinabirdclub.org/gallery/Smolen-Morton/sbgu.html); there is a sight report for North Carolina in 2003 (https://ebird.org/checklist/S12013539).

Sandwich "Cayenne" Tern, *Thalasseus sandvicensis eurygnathus*

2021-1590 (JGr, BPr). This bird was photographed by John Groskopf on 22 September 2021 at Siesta Key Beach; it was present until 3 October. The bird was about the same size as adjacent Cabot's Sandwich Terns (*T. s. acudiflavus*), but, unlike that species, the bill was longer and dull orange, with black smudges around the nares. Unlike Elegant Tern (*T. elegans*), the dark nape and rear crown did not extend to the crown above the eye; the dark in the face extended to a spot anterior to the eye, but the areas above and below the eye were white.

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The FOSRC has previously accepted three records of Cayenne Tern, the southern race of Sandwich Tern that breeds in the southern Caribbean and along the Atlantic coast of northern South America. Like the submission here, all three precious records were from Sarasota County: August 2012 (FOSRC #2012-912; Greenlaw 2016b), October 2016 (FOSRC #2016-1102; Kratter 2018a), and September–November 2017 (FOSRC #2018-1276). Some or all of these records may involve the same individual. The identification of *Thalasseus* terns in Florida is further complicated by possible hybrid offspring between Elegant Terns and Cabot's Sandwich Terns. Those hybrids are thought to be larger and have more black in the bill.

Elegant Tern, *Thalasseus elegans*

2020-1461 (MVB). This tern was photographed in flight by Mario V. Balitbit on 30 December 2019 at Blind Pass Beach in Lee County.

2020-1507 (AAl). On 25 May 2020, Audrey Albrecht photographed this breeding plumaged tern on Sanibel Island (Lee County). Dark markings on the dorsal side of the secondaries indicate that this is a different bird than 2020-1461 (above).

2021-1601 (Che). Claire Herzog photographed this tern resting on the beach at Siesta Key Beach (Sarasota County) on 4 November 2021. It was not seen after.

With these three birds, FOSRC has now accepted 16 submissions of Elegant Terns in Florida; ten of these were in Sarasota County) and 14 of these were clustered on the Gulf Coast between Pinellas and Lee counties; the exceptions were in the Florida Keys (FOSRC #2015-1071, April 2015 at Pigeon Key, Monroe County) and the Panhandle (FOSRC #2018-1265, June 2017 at Santa Rosa Beach, Walton County). It is possible, even likely, that the same bird(s) may account for several Sarasota County and nearby records.

Red-billed Tropicbird, *Phaethon aethereus*

2021-1580 (RaD, RT). This subadult was found and photographed on a pelagic trip off Miami (about 15 miles east of Elliot Key) on 13 June 2021.

2021-1598 (DMQ, TMQ). On 8 August 2021, David and Tammy McQuade found and photographed this adult on a Gulf of Mexico boat trip off Lee County (about 75 km WSW of Sanibel Island; 26.267222, –82.877778).

The FOSRC has previously accepted 16 submissions of Red-billed Tropicbird, two from the Gulf coast of the Panhandle, 11 from the Atlantic Coast, and three from the Lower Keys. Greenlaw et al. (2014) consider it a rare visitor off the Atlantic Coast, and an occasional visitor off the Gulf coast.

Pacific Loon, *Gavia pacifica*

2021-1549 (AWK). Andy Kratter found and photographed this adult on 17 December 2020 at Lake Santa Fe during the Melrose Christmas Bird Count.

This species was added to the Review List in 2016 and one record was accepted at our 2017 meeting (FOSRC #2017-1238, three in Escambia County in Mar–Apr 2017; Kratter 2018b). A few Pacific Loons were also reported (one photographed) in Escambia County during the period covered by this report but were not submitted to the FOSRC. Greenlaw et al. (2014) listed it as a very rare winter visitor.

Bulwer's Petrel, *Bulweria bulweria*

2021-1592 (RoD, LD). This all dark, smallish petrel was discovered beached on 31 August 2021 near the Pensacola Beach Fishing Pier (Escambia County) after Hurricane Ida pushed up the western Gulf of Mexico. The bird was brought to the Wildlife Sanctuary of Northwest Florida for care. Photographs by Bob and Lucy

Duncan were circulated among pelagic experts and the identification was eventually established, based on the all-dark plumage, measurements, and the strongly graduated tail. It regained strength and was released on 4 September 2021.

This is the first documented record for Florida and for the Gulf of Mexico of this pantropical species. The closest breeding colonies are in the eastern Atlantic in the Azore Islands. North Carolina has one documented record (off Oregon Inlet Aug 1998; LeGrand et al. 1999) and there are accepted sight reports for Virginia (2 Sep 2006 following Hurricane Ernesto) and North Carolina (1 Jul 1992; LeGrand 1994). Two previous Florida sight reports, three west of Key West on 4 May 1969 (Taylor 1972) and one on 1 May 1984 off Jacksonville Beach (Haney and Wainwright 1985), have not been accepted because they lack verifiable evidence (Greenlaw et al. 2014).

Wedge-tailed Shearwater, *Ardenna pacifica*

2021-1589 (PPl). Peter Plage found and photographed this remarkable bird on 31 August 2021 at Fort De Soto County Park (Pinellas County). The photographs, distant but diagnostic, show the typical size and shape of an *Ardenna* shearwater, with streamlined body, long narrow wings, and a long narrow bill. The tail, however, is noticeably longer than any other shearwater species. The wingspan appeared somewhat longer than the nearby Laughing Gulls (*Leucophaeus atricilla*) in the same frame, though the body was slighter. This was a pale morph with dark upperparts, including the tail, rump, nape, face, and cap, all white underparts, and white underwing coverts contrasting with a dark leading edge and dark remiges. From above, the remiges were black, with the coverts dark brown. The bill is all black. The size and shape rule out smaller shearwaters (*Puffinus* spp.). The long tail, when seen well, is diagnostic for Wedge-tailed Shearwater (Howell 2012). The other black and white *Ardenna* shearwater in the Atlantic, the Great Shearwater (*A. gravis*), is somewhat similar but has a more limited black cap, a white collar, a white rump patch, and a dark belly. The smaller Buller's Shearwater (*A. bulleri*), restricted to the Pacific Ocean, has dark outer wings and greater secondary coverts contrasting with pale gray back, secondaries, and lesser upperwing coverts.

The Wedge-tailed Shearwater, a largely tropical species, breeds in the northern Indian Ocean and in the north central and tropical South Pacific Ocean. In the ABA Area, it breeds in Hawaii and occasional strays reach the California coast. The only previous records for the north Atlantic and Gulf of Mexico were earlier in 2021 in North Carolina, when one, also a pale morph, was well documented off the Outer Banks of North Carolina, and another pale morph off Corpus Christi, Texas in June 2022 (https://texaspelagics.com/texas_seabirds/wtsh/ (https://ebird.org/checklist/S88778853). It is not inconceivable that all three of these records pertain to the same bird.

Manx Shearwater, *Puffinus puffinus*

2020-1478 (AWK). This hatch-year female shearwater washed up on the shoreline in Pensacola (Escambia County) on 26 November 2019 and was brought to the Wildlife Sanctuary of Northwest Florida, where it died. The specimen was donated to the FLMNH and a study skin was prepared (UF53366).

The FOSRC has now accepted 17 submissions, 16 from Florida's Atlantic Coast (Nassau County south to Miami-Dade County), and now two from the western Panhandle. Five earlier specimens (Stevenson and Anderson 1994) have not been assessed by the FOSRC. Greenlaw et al. (2014) considered it a rare winter visitor, although they may occasionally occur in the summer in Florida (Kratter 2019).

Red-footed Booby, *Sula sula*

2021-1579 (LoM). This subadult was photographed by Lori Mathis at Dry Tortugas National Park (Monroe County) on 8 June 2021. It was seen there until 21 June.

2020-1526 (AWK). This juvenile female, found washed ashore at the Pensacola Naval Air Station (Escambia County) on 8 June 2020, died 15 June at the Wildlife Sanctuary of Northwest Florida. The specimen was donated to the FLMNH, where a study skin (plus partial skeleton and spread wing) was prepared (UF53724).

This species was added to the Review List in 2016. Two submissions have been accepted since: a June 2016 specimen from Pinellas County (Kratter 2018a), and one photographed off Miami-Dade in November 2013 (Kratter 2018b). Greenlaw et al. (2014) listed it as an irregular rare visitor from breeding colonies in the West Indies.

Great Cormorant, *Phalacrocorax carbo*

2020-1443 (CPh). Cheri Phillips photographed this adult at Huguenot Memorial Park (Duval County) on 11 October 2019. It was present for two additional days.

2020-1457 (PHa). On 1 December 2019, Paul Harvey, visiting from England, found and photographed thus immature bird at Boggy Bayou, near Eglin Air Force Base (Okaloosa County).

2021-1607 (MPr, TRt, LSp). Matthew Press found this immature conveniently roosting side by side with Double-crested Cormorants (*Nannopterum auritum*) at Myakka River State Park on 20 November 2021. It was seen by dozens of birders until 5 February 2022.

This species was added to the Review List in 2016; accepted records since include one photographed in January 2016 in Pinellas County (FOSRC #2017-1167; Kratter 2018b) and a specimen from Marathon Key (Monroe County) in March 2018 (FOSRC #2018-1329; Kratter 2019).

Neotropic Cormorant, *Nannopterum brasilianum*

2020-1491 (CE). Charlie Ewell found and photographed this adult at Sanctuary Golf Club in Lee County on 7 March 2020.

2021-1582 (MRo). This adult, found by J. Bianchetta on 15 June 2021 at Cape Harbour Marina in Cape Coral (Lee County), was photographed by Meg Rouscher.

These two are the first records accepted by the FOSRC from the west coast of Florida. Records of Neotropic Cormorants in Florida have increased in south Florida since the first ones were found in 2007 (Greenlaw and Kratter 2007) and especially since they were discovered breeding (usually with Double-crested Cormorants) at Wakodahatchee Wetlands in Palm Beach County in 2012 (Greenlaw 2014). Many additional records not submitted to the FOSRC, including continued breeding at Wakodahatchee Wetlands, can be found on eBird.

Golden Eagle, *Aquila chrysaetos*

2020-1479 (DRo). On 27 October 2014, Dotty Robbins saw this immature bird at the Okee-tantie Recreational Area (Okeechobee County). Her description mentioned the size (compared with nearby Turkey Vultures [*Cathartes aura*]), dark plumage, and distinct sharply demarked white tail base and white bases to the remiges.

Golden Eagles are rare winter visitors to Florida (Greenlaw et al. 2014), with most records in the Panhandle. This species was added to the Review List in 2016. Only one previous submission to the FOSRC has been accepted: an immature photographed in November 2019 in Jefferson County (Kratter 2020). Seven submissions, all sight reports, were not accepted, often because they did not

eliminate immature Bald Eagle (*Haliaeetus leucocephalus*) from the identification (Kratter 2018b; see below).

Zone-tailed Hawk, *Buteo albonotatus*

2021-1577 (LGl). On 24 May 2021, Luis Gles, an experienced raptor migration counter, photographed a flying hawk in Islamorada (Monroe County). The distant images show an all-dark *Buteo* with long wings, pale undersides to the remiges with dark trailing edges, and a long tail with a broad terminal dark band and narrow black bands against a white background more proximally. The bird was noted as flying with its wings in a "strong dihedral," similar to a Turkey Vulture (*Cathartes aura*).

This is the second record for Florida. The first (FOSRC #2000-433; Bowman 2004) was photographed over Big Pine Key 3 December 2000, and then likely the same bird again in Boca Grande on 12 December 2000 (Wilmers 2005). There are very few records in eastern North America; what may have been the same bird was noted over two years (Apr 2014 to Sep 2015) in Massachusetts, Nova Scotia, New Jersey, Delaware, Rhode Island, and Virginia. Zone-tailed Hawks were also noted in Maryland in April 2021 and New York in April 2022 (eBird).

Mitred Parakeet, *Psitticara mitrata*

2020-1534 (WCT, SE). The expansion of the south Florida population in Miami-Dade and Broward counties was detailed by Epps and Chatfield-Taylor (2020).

Mitred Parakeets, native to the Andes of Bolivia and Peru, were first detected in Florida in the early 1980s as large numbers of birds were imported into the United States for the pet trade, mainly from Bolivia. Although importations stopped in 1990, numbers of escaped or released birds began to congregate, especially in Kendall and Fort Lauderdale. Nesting was documented in 1998. Numbers on the Christmas Bird Counts in south Florida were 104 in 2004, and climbed to over 600 by 2017, indicating significant population expansion. The FOSRC determined that the south Florida population of Mitred Parakeet met the criteria to be considered an established exotic (criteria for determining establishment of exotics are available from the author).

La Sagra's Flycatcher, *Myiarchus sagrae*

2020-1487 (LaM, HDF). This bird was found by Bob Showler on 26 November 2019 on Research Road in Everglades National Park (Miami-Dade County). It was extensively photographed and audio recorded during its stay util 19 March 2020.
2021-1541 (LaM). Kevin Christman found this bird on 20 November 2020 at the Florida Keys Wildlife and Environmental Area—Dove Creek on Key Largo (Monroe County). It was present until 25 November 2020.
2021-1551 (CSa). Carlos Sanchez found and photographed this bird at Camp Owaissa Bauer in Redlands (Miami-Dade County) on 20 December 2020; it was also seen 9 January 2021.

This species, found in the Bahamas and Cuba, was added to the Review List in 2016. Two records were accepted in 2017 (Kratter 2018b), one in 2018 (Kratter 2019), and four in 2019 (Kratter 2020). Although this rate of occurrence (ten accepted records in five years) is at the two per year criteria for removal from our Review List, the Committee feels that it is important to keep vagrants from the West Indies, such as La Sagra's Flycatcher, on the Review List, especially because Florida is the only state where they are found in the ABA Area. With one exception, all records are from Southeast Florida (the Keys north to Palm Beach County); the exception was one in Manatee County in April 2013 (Greenlaw 2016a).

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Sulphur-bellied Flycatcher, *Myiodynastes luteiventris*

2020-1445 (KD). This bird was found and photographed by Kelly Ducham at Fred Coyle Freedom Park in Naples (Collier County) on 20 October 2019. It was seen by a few other birders that day but not relocated afterwards.

The FOSRC has now accepted 18 submissions of this species. All were recorded between mid-September and mid-November. This highly migratory species breeds from the mountains of Arizona and New Mexico south through Mexico to northern Central America, and winters in southern Central and South America.

Piratic Flycacther, *Legatus leucophaius*

2021-1546 (AD). Andrew Durso found and photographed this bird on private property in Fort Myers (Lee County) on 6 November 2020. A few other birders were able to see this rarity on the ensuing three days. Photos show a small plain flycatcher with a bold face pattern (dark face and crown, pale supercilium, a thin dark moustachial streak), pale yellowish underparts with indistinct dark breast streaks, small dark bill, plain brownish tail, and indistinct pale wingbars.

This is just the second Florida record for this widespread Neotropical species. The first, found on the Dry Tortugas on 15 March 1991, was initially identified as a Variegated Flycatcher (*Empidonomus varius*) but was not correctly identified until years later (Bowman 2006). This species, which breeds north into central Mexico (San Luis Potosí) is a rare straggler to the ABA Area, with records in Texas (Apr 1998, Oct 2000, Mar 2006, Sep 2007, May 2008, Sep 2015, Sep 2018, Aug 2021), twice in New Mexico (Sep 2003, Sep 2012), and once in Kansas (May 2015).

Variegated Flycatcher, *Empidonomus varius*

2021-1585 (MRe). This bird was found by a homeowner in Ocala (Marion County) on 8 September 2021. It was photographed on 13 October by Michelle Reyes who sent the images to experts for identification. It was seen by a few other birders that day but not relocated afterwards. Images show a medium-sized flycatcher with a strong head pattern (dark face and crown, pale supercilium, broad dark moustachial streak), pale yellowish underparts strongly streaked dark on breast, and a moderately long bill that is slightly paler at base. Photographs by other birders (https://ebird.org/checklist/S94681739) show that the rump is strongly edged rufous.

This is the third Florida record. The first was in St. Johns County in June 2013 (FOSRC #2013-984; Greenlaw 2015), and the second in Broward County in October 2015 (FOSRC #2016-1100; Kratter 2018b). Variegated Flycatchers breed primarily south of the Amazon Basin to central Argentina in South America and migrate north to spend the austral winter in northern South America, south to Peru and the Brazilian Amazon. Other populations appear to be resident in the Guianas and northeast South America. The timings of the Ocala and Broward County birds suggest that they were reverse migrants, a bird that flies 180 degrees opposite the usual direction, as is found in some Fork-tailed Flycatchers (*Tyrannus savana*; McCaskie and Patten 1994). The 2013 bird in St. Johns County, in contrast, likely represented an overshoot migrant (McCaskie and Patten 1994). Previous records in the ABA Area include five other likely reverse migrants (5–11 Nov 1997 in Maine; 7 Oct–6 Nov 1993 and 13–17 Nov 2020 in Toronto, Canada; 6–7 Sep 2008 in Washington State; and 28 Sep–2 Oct 2016 in Texas) and one other likely overshoot (13–15 May 1984 in Tennessee).

Cassin's Kingbird, *Tyrannus vociferus*

2021-1539 (RSm). Ron Smith found and photographed this bird at Fort DeSoto County Park on 13 October 2020. It was not refound.

This is the twentieth submission of Cassin's Kingbird accepted by the FOSRC. Most of these have been from central Florida (Hillsborough and Flagler counties) south; the exceptions were in Leon County (Jan 2018), Okaloosa (Oct 2000), and Duval (Oct 2008) counties. This kingbird, largely confined to western North America, is considered a rare, regular winter resident to Florida (Greenlaw et al. 2014).

Fork-tailed Flycatcher, *Tyrannus savana*

2020-1451(DS). David Simpson found and photographed this bird at LeRoy Wright Park in Cocoa (Brevard County) on 28 October 2019.

2021-1573 (AHo). This bird was discovered and photographed by Alan Hoffman at Fort Zachary Taylor Historic State Park on Key West on 21 April 2021. It was seen by a few other birders that day but not afterwards.

This species was added to the Review List in 2016. Three birds were accepted by the FOSRC at our 2016 meeting, two birds were accepted in 2017, and one was accepted in 2018 (Kratter 2019). Greenlaw et al. (2014) list it as an "almost regular, very rare visitor." Records are scattered from throughout the year, and likely represent both reverse migrants and overshoot migrants (see above; McCaskie and Patten 1994).

Western Wood-Pewee, *Contopus sordidulus*

2021-1595 (AWK). This bird was found weak in Miami Beach on 22 October 2020 and brought to the Pelican Harbor Seabird Station. Identified there as an Eastern Phoebe (*Sayornis phoebe*), it died on 24 October. The specimen was donated to the FLMNH where a study skin was prepared (UF53928). The dark plumage and wing measurements, especially the long primary extension and short tail, confirmed it as a Western Wood-Pewee, using criteria in Pyle (1997).

This is the third confirmed record and first specimen record for Florida for this long-distance migrant, which breeds in western North America and winters in South America. Previous records include a vocalizing bird recorded 19 June 1995 in Highlands County (FOSRC #1995-342; Woolfenden et al. 1996), and a vocalizing bird recorded 1–2 October 2015 in Hillsborough County (FOSRC #2015-1059; Greenlaw 2016b). A bird recorded 26–28 October 1986 in Wakulla County (FOSRC #1986-107) was initially accepted (Dowling 1989), but after reanalysis was determined to be indistinguishable from Eastern Wood-Pewee (*Contopus virens*; Anderson 1996, Woolfenden et al. 1996).

Cuban Pewee, *Contopus caribaeus*

2021-1540 (KC, RGu, NFO, TMQ, DMW). This long-staying bird was found on 1 November 2020 by Kevin Christman at Blue Hole State Park on Big Pine Key (Monroe County); it was last seen 24 February 2021.

There have been eight previous Cuban Pewees accepted by the FOSRC: birds in Palm Beach County in March 1995 and November 1999; birds in Monroe County in February 2001 (sight report) and March 2018; and birds in Miami-Dade County in September 2010, March 2016, April 2017, and a different bird there in May 2017. The species is resident in the Bahamas and Cuba.

Yellow-bellied Flycatcher, *Empidonax flaviventris*

2019-1379 (MKr). This bird was photographed and video-recorded by Mark Kramer at Deering Estate in Miami (Miami-Dade County) on 10 December 2019.

It was not accepted by the Committee at the 2019 meeting (Kratter 2020), but on learning that *Empidonax* experts Dan Lane and Chris Benesch had both thought it was a *flaviventris*, the Committee opted to reopen. Both experts were again consulted and both reaffirmed *flaviventris* based on the rising squeaky vocalizations, which are typical on their Central American wintering grounds but unfamiliar to many in North America.

2020-1446 (TKn). On 20 October 2019 Tammarin Knuth video-taped thus bird in Largo (Pinellas County).

2020-1448 (MRo, EW, NG). This bird was photographed and audio-recorded at the Rotary Park Environmental Center in Cape Coral (Lee County) on 23 October 2019.

2020-1449 (JCl). JoAnna Clayton beautifully photographed this bird at Fort DeSoto Park in Pinellas County on 24 October 2019.

2021-1608 (AKe). This bird was found in a residential yard in Gainesville (Alachua County) on 31 October 2021 by Adam and Gina Kent. It over-wintered and was extensively photographed and audio-recorded during its stay until 7 April 2022. What was likely the same bird made a brief foray about 3 miles to the southeast on 26 January 2021; the bird was absent from the Kent's yard 23 January to 11 February.

The Gainesville bird is the first documented Yellow-bellied Flycatcher to over-winter in the ABA Area, and the December record in Miami is one of very few records in December. In addition, a recently accepted record (FOSRC #2017-1221) is from early March, much earlier than expected for a migrant, and may have been a wintering bird (Kratter 2018b). Otherwise, it is considered a very rare to uncommon transient (Greenlaw et al. 2014). This species was added to the Review List in 2016. Two submissions were accepted in 2017 (Kratter 2018a), one was accepted in 2018 (Kratter 2018b), and two were accepted in 2019 (Kratter 2020). Over the past 10 years, eBird lists many occurrences for Florida, but even documented records can be quite difficult to identify. In particular, identification of silent migrant birds can be treacherous, and bright fall Acadian Flycatchers (*E. virescens*) are often mistaken for Yellow-bellied.

ALDER FLYCATCHER, *Empidonax alnorum*

2020-1521 (RGu, NFO, LaM). One or more birds were photographed and audiotaped at the L-31W Canal west of Homestead (Miami-Dade County) between 30 August and 4 September 2020. Additional Alder Flycatcher identified by calls and songs were present at nearby Southern Glades WEA-(The Annex) and Frog Pond WMA (Lucky Hammock) between 18 August and 20 September 2020.

2020-1516 (AHe, LGo, RDi). This bird was photographed and audio-recorded 29–31 August 2020 along the Anhinga Trail in Everglades National Park (Miami-Dade County).

Although Alder Flycatchers are regular migrants through Florida in the fall (Greenlaw et al. 2014, eBird records), the FOSRC has kept the species on the review list because of difficulties of identification in the genus *Empidonax*, especially with the more uncommon Willow Flycatcher (*Empidonax traillii*). The FOSRC has now accepted 24 submissions, one from spring and 23 from fall, since it began to solicit submissions of this species in 2008.

WILLOW FLYCATCHER, *Empidonax traillii*

2020-1434 (JoG). This bird, photographed and its calls described by John Groskopf, was found on 29 August 2020 at North Lido Beach Park (Sarasota County). Described calls match Willow Flycatcher but were not recorded.

2021-1586 (NFr). On 14 September 2021, Noah Frade photographed and audio-recorded this flycatcher at West Biscayne Pineland Preserve in Homestead (Miami-Dade County)..
2021-1588 (JMO). This bird was photographed and audio recorded by Joseph Montes de Oca on 12 September 2021 at South Pointe Park in Miami Beach (Miami-Dade County).

Willow and Alder Flycatchers present vexing identification problems. Silent birds are generally not identifiable, except some may be distinguished by measurements in the hand. Judging by the frequency of documented records on eBird and accepted records of the FOSRC, the Willow Flycatcher appears to be much less common than the Alder Flycatcher in Florida. The FOSRC has accepted eight previous submissions (one spring, one mid-June, six fall) since it began to solicit submissions of this species in 2008.

Hammond's Flycatcher, *Empidonax hammondii*

2020-1463 (YM, HSh, KDu, HWh, ShB, SuB, MRo, JPL, KL, WCT, LoM, RSS, LOB, EW, LaM, DD). This bird was initially found on 6 October 2020 at Corkscrew Swamp Sanctuary (Collier County) and understandably identified as a Least Flycatcher (*Empidonax minimus*). During its wintering stay, John Groskopf determined that it was likely a Hammond's Flycatcher and over the next several months extensive documentation (photographs and audio-recordings) cemented the identification.
2020-1474 (JHe). On 2 February 2020, Jason Hedges, a visiting birder to Florida, photographed this bird at Frog Pond WMA (Lucky Hammock) in Miami-Dade County. The single photograph captured the small mostly dark bill, greenish back, whitish underparts, distinct and white almond-shaped eye ring, and the long primary extension characteristic for Hammond's Flycatcher.
2021-1604. Jeff O-Connell photographed this bird at St. Marks National Wildlife Refuge (Wakulla County) on 13 October 2019. The identification drew lots of discussion online, with some experts feeling that it was a Least Flyctacher, while most experts sided with Hammond's, The observer noted and the photographs show:

1) Very small overall, with that bigger-headed, smaller bodied look of a Least, Hammond's, or Dusky Flycatcher (*Empidonax oberholseri*).
2) Narrow, deeply notched tail with white outer webs.
3) Small, flat, thin bill. Dark tip on mandible not as extensive as some Hammond's.
4) Bold and pointed rear half of eye ring.
5) Moderate to long primary projection. On the very long end for Least, and while on the shorter end for Hammond's.
6) Dark and colorful, with grayish dusky face, throat, and vest, and olive wash to back, yellowish wash to belly. The grayish of the face contrasted somewhat with the olive back.
7) Crested appearance to the head, which stayed pretty constant even when the bird looked relaxed

Prior to these three submissions, Florida had had only two records: one October 2006 in Pinellas County (FOSRC #2006-615; Kratter 2008), and on January–March 2007 in Orange County (FOSRC #2006-627; Kratter 2008). Aside from these Florida records, this western North American species has been noted only twice in southeastern North America (records in Alabama and North Carolina), although the northeast has several records from Nova Scotia south to New Jersey (eBird).

Pacific-slope Flycatcher, *Empidonax difficilis*

2020-1486 (FGo, DFr). Donald Fraser discovered and photographed this bird on 10 March 2020 at Goldhead Branch State Park in Clay County. It was extensively photographed and high-quality audio recordings were obtained during its stay until 24 March. Identification and analyses are presented in Pranty et al. (2020).

This is the first record of this western North American species for Florida, although three previous records of "Western" Flycatchers have been accepted by the FOSRC (see below). Pacific-slope and its closely related sister species Cordilleran Flycatcher (*E. occidentalis*) were formerly lumped as Western Flycatcher. Separating Cordilleran and Pacific-slope Flycatchers in the field can only be conclusively accomplished using vocalizations; the two taxa are purported to hybridize extensively where their ranges meet (Rush et al. 2009). Most records in the Western Flycatcher complex in eastern North America are presumed to be Pacific-slope Flycatchers (Goldberg and Mason 2017, eBird records).

Pacific-slope/Cordilleran Flycatcher, *Empidonax dificilis/occidentalis*

2021-1609 (AKe). This bird was photographed and audio-taped by Adam and Gina Kent in Gainesville (Alachua County) on 7 November 2020. It was heard again by a few birders on the following day.

Two previous records of the "Western" Flycatcher complex have been accepted by the FOSRC: one (FOSRC #2015-1063) in Tallahassee (Leon County) on 8 January 2018 (Kratter 2018a), and one (FOSRC #2016-1093) at Fort Pickens State Park (Escambia County) on 1–2 October 2016 (Greenlaw 2016b). Pacific-slope and its closely related sister species Cordilleran Flycatcher were formerly lumped as Western Flycatcher. Separating the two species in the field can only be conclusively accomplished using some vocalizations; adding further complexity, the two taxa are purported to hybridize extensively where their ranges meet (Rush et al. 2009). Most records in the Western Flycatcher complex in eastern North America are presumed to be Pacific-slope Flycatchers (Goldberg and Mason 2017, eBird records).

Thick-billed Vireo, *Vireo crassirostris*

2020-1432 (LGl, LaM). Luis Gles found, photographed, and audio-recorded this bird at Long Key State Park (Monroe County) on 21 August 2019. It entertained many birders until 23 September 2019.

2020-1442 (GSi). Gael Silverblatt found and photographed this bird at a private residence in Lake Worth (Palm Beach County) on 11 October 2019; it was also seen the following day by a few birders and then again on 2 November 2019.

2020-1515 (HGo). On 26 August 2020, Hans Gonzembach photographed this bird at R. Hardy Matheson Reserve in Miami (Miami-Dade County). It delighted many birders during its stay until 11 September.

2020-1519 (ASh). Alexander Sharp photographed this vireo on 9 September 2020 at Key Biscayne, Bill-Baggs State Park (Miami-Dade County); it was not relocated.

2020-1524 (WCT). A bit more than one year after a Thick-billed Vireo (FOSRC #2020-1432, above) was found at Long Key State Park, Will Chatfield-Taylor found, photographed, and audio-taped a Thick-billed Vireo on 19 September 2020. It was not refound.

2021-1597 (BRa). A bit more than one year after the Thick-billed Vireo (FOSRC #2020-1515, above) was found at R. Hardy Matheson County Preserve in Miami, Raul Urgelles found the same species on 7 October 2021. It also stayed for a few weeks, last being seen on 27 October.

The bumper crop of Thick-billed Vireos in Florida in 2019–2021 was unexpected; previously the FOSRC had accepted 20 submissions over the 31-year tenure of the FOSRC. Of 26 submissions now accepted, all but one have been in the four Southeast Florida counties (2 in Palm Beach, 4 in Broward, 14 in Miami-Dade, and 5 in Monroe); the exception was one in Pinellas County in October 2006 (FOSRC #06-613; Kratter 2008). Dates of occurrence are from August to May. This Caribbean species is resident in the Bahamas, Turks and Caicos, Cuba, and the Cayman Islands.

YELLOW-GREEN VIREO, *Vireo flavoviridis*

2020-1438 (KTr). Ken Tracey photographed this bird at the James E. Grey Preserve in New Port Richey (Pasco County) on 17 September 2019. This is the first record from Pasco County.

2020-1527 (DSi). David Simpson audio-recorded this bird on 28 June 2020 in Fellsmere (Indian River County). This is the first record from Indian River County.

2021-1547 (MMS). Malcolm Mark Swan photographed this bird on 29 April 2020 at Veterans Park on Okaloosa Island,(Sant Rosa County; it was also seen the following day.

2021-1583 (BPr). On 20 June 2021, Noah Frade discovered tis bird near the Dante Fascell Visitor Center at Biscayne National Park (Miami-Dade County). Late in June Michelle Davis discovered a nest that was being attended by the Yellow-green Vireo and a Black-whiskered Vireo (*V. altiloquus*). Nestlings were produced but they were found dead below the nest on 18 July. Details of this first-ever hybrid combination nesting attempt were in Pranty et al. (2021).

These four submissions bring the number of Yellow-green Vireos accepted by the FOSRC to 18; there is also a specimen from May 1958 in Santa Rosa County that has not been evaluated by the FOSRC (Greenlaw et al. 2014). Five of the records are from the western Panhandle, four are from Pinellas or Pasco counties, two are from Brevard or Indian River counties, and nine are from south Florida and the Keys (Palm Beach, Miami-Dade, and Monroe counties). All records are from May to November.

SAGE THRASHER, *Oreoscoptes montanus*

2020-1532 (AHu). On 13 October 2020, Adam Hull discovered and photographed this bird in Deland (Volusia County). It could not be relocated despite persistent effort by area birders. In February 2021, a Sage Thrasher was discovered about 35 km east at New Smyrna Dunes State Park. That record was not received in time to be evaluated here; it will be evaluated at the 2022 meeting.

This is the fourth Sage Thrasher submission accepted by the FOSRC, but the first in ten years. Previous records include one photographed 6 March 1981 in Taylor County (FOSRC #1981-006), one photographed 15–16 January 2011 in Escambia County (FOSRC #2011-836), and one photographed 11–14 November 2011 in Franklin County (FOSRC #2011-877). A specimen from Gilchrist County collected on 11 January 1969 has not been evaluated by the FOSRC (Johnston 1969). The Sage Thrasher is a short-distant migrant found in arid-lands in western North America.

BAHAMA MOCKINGBIRD, *Mimus gundlachii*

2020-1431(AAb). On 9 July 2019, Angel Abreu audio-recorded this bird and later that day photographed it at Bill Baggs Cape Florida State Park. It was last seen 19 July.

2021-1591 (JoG). John Groskopf found and photographed this bird on 1 July 2021 at North Lido Beach Park in Sarasota County. It was seen by several other birders that day but not relocated thereafter.

This species was added to the Review List in 2016. Two Bahama Mockingbird submissions were accepted in 2016 (Kratter 2018a), one was accepted in 2017 (Kratter 2018b), five were accepted both in 2018 and 2019 (Kratter 2019, 2020). Although this rate of occurrence is higher than the criteria for removal from the Review List, the Committee feels that it is important to keep vagrants from the West Indies, such as Bahama Mockingbird, on the Review List, especially because Florida is the only state where they are found in the ABA Area. Greenlaw et al. (2014) listed it as a nearly regular, very rare to rare visitor. Most records are from the southeastern coast and keys, but the species has been found as far north as Brevard County on the Atlantic Coast, and Pinellas County on the Gulf of Mexico coast. The species is found in the Bahamas and scattered in the Greater Antilles, usually on the immediate coast or on smaller islands peripheral to the main islands.

MOUNTAIN BLUEBIRD, *Sialia currucoides*

2020-1466 (DGa). David Gagne found and photographed this bird, likely an immature male, on 16 January 2021 in rural lands northwest of Dade City (Pasco County). It obligingly stayed for many birders until 12 March.

This is the fourth accepted submission of this western montane species for Florida. Previous records include a female in December 2002 in Miami-Dade County (FOSRC #2003-296; Bowman 2006), a female on the Monroe County in December 2010 (FOSRC #2011-833, 2012), and a female in November 2015 in Collier County (FOSRC #2016-1106; Kratter 2018a).

BICKNELL'S THRUSH, *Catharus bicknelli*

2020-1500 (JE, NFo, RGu). Will Johnson found, photographed, and audio-recorded this bird at Sebastian Inlet State Park (Indian River County) on 9 May 2020. It was seen by many birders during its four-day stay until 12 May.

2020-1501 (MDu, MGo). Carl Edwards found this singing bird at Lantana Nature Preserve (Palm Beach County) on 12 May 2020, and it was audio-recorded and photographed by many birders during its stay until 17 May.

2020-1503 (JGu, LMA). Marisa Martinez found and photographed this singing bird on 16 May 2020 at Serenoa Glade Preserve in Boca Raton (Palm Beach County). It was audio-recorded later during its two-day stay.

The FOSRC has previously accepted seven submissions of the Bicknell's Thrush, four in the spring and three in the fall. The species was originally added to the Official List based on specimens analyzed by Woolfenden and Greenlaw (2005). The first six records accepted by the FOSRC were of birds banded and measured in Monroe (2), Miami-Dade (2), Okeechobee, and Martin counties. In 2019 the FOSRC accepted a singing bird that was audio-recorded in Palm Beach County (at Lantana Nature Preserve) in May 2019. These recent records indicate that Bicknell's Thrush may be a regular spring stopover migrant at migration hotspots along Florida's southeast coast.

RED-LEGGED THRUSH, *Turdus plumbeus*

2020-1530 (LMa). This bird, likely from Cuban populations, was found by David Essian and Julia Roblyeron on 10 October 2020 at Key West Tropical Forest and Botanical Garden on Stock Island near Key West (Monroe County). It delighted many birders during its stay until 14 October 2020.

This is the fourth record from Florida but the first of a bird from the western Cuban subspecies (*T. p. rubripes*), as indicated by the buffy belly. Previous records were of the subspecies *plumbeus* from the Bahamas: FOSRC #2010-807 at Maritime Hammock Preserve in Brevard County on 31 May 2010 (Anderson and Ponce 2010 Kratter 2012a), FOSRC #2019-1406 at Lantana Nature Preserve in

Palm Beach County on 25 April 2020 (Kratter 2020), and FOSRC #2019-1419 at South Pointe Park in Miami Beach from 26–30 June 2020 (Kratter 2020). Some authorities split *plumbeous* and *rubripes* (BirdLife International 2022), but the AOS North American Classification Committee has held off until more in-depth genetic studies can be done (Chesser et al. 2022).

European Robin, *Erithacus rubecula*

2019-1404 (MBe). Mark Berney found and photographed this bird at Mizell-Johnson State Park in Dania Beach on 14 October 2018. It was not relocated.

This is the first accepted record for Florida and the second for the ABA Area (Pyle et al. 2018). The vote at our 2019 meeting was unresolved. The identification was not in question, and the bird is of the expected migratory nominate race, which breeds in northern Europe. This state park, however, is in close proximity to the deep-water Port Everglades, and some members of the Committee were concerned in 2019 that the bird may have been ferried here on a cargo or passenger ship. The submitter analyzed shipping schedules, and no cruise ships originating in western Europe entered the port in the preceding days of the observation.

The ABA Checklist Committee recently accepted a record of European Robin from Pennsylvania in February and March 2015 as a wild vagrant (Pyle et al. 2018). On 14 December 2015, a European Robin was photographed on a cruise ship that had recently come to port in Miami (Birding Florida Facebook post on 15 Dec 2015: https://www.facebook.com/groups/49535001197/?post_id=10153250032381198). It was not submitted to the FOSRC for evaluation.

Northern Wheatear, *Oenanthe oenanthe*

2021-1610 (AKe). Adam Kent photographed this bird on 13 October 2021 on private property in rural Okeechobee County (27.659, –80.791).

This is the tenth submission of this largely Palearctic species accepted by the FOSRC; a specimen from 1955 from Collier County (Greenlaw et al. 2014) has not been assessed by the FOSRC. All are fall records (21 Sep–2 Nov).

Tricolored Munia, *Lonchura malacca*

2020-1456 (KCh). Kevin Christman photographed this adult at Frog Pond WMA (Lucky Hammock) in Miami-Dade County on 28 November 2019.

This Southeast Asian species, which has established introduced populations in Hispaniola and Cuba, was accepted onto the Florida List in 2016 based on a few records of individuals on the Dry Tortugas (Greenlaw 2016a). These were deemed to be more likely vagrants from Cuba than escapes from captivity from urban centers in Southeast Florida or from refugees crossing from Cuba in boats (Greenlaw 2016a). The species was accepted by the ABA Checklist Committee in 2020 (Pyle et al. 2020). The vote on this individual at our 2020 meeting was unresolved; some members questioned provenance given that the location is in much closer proximity than the Dry Tortugas to major metropolitan areas where Tricolored Munias may be found in captivity. At our 2021 meeting, the bird at Lucky Hammock was accepted. Members felt that the location was significantly isolated from the metropolitan areas of Southeast Florida, and that the excellent photographs revealed that the bird showed no signs of captivity.

Eastern Yellow Wagtail, *Motacilla tschutschensis*

2020-1514 (JGR). On 21 August 2020, Janice G. Rinehart, shorebird biologist, took a single photograph of an unknown passerine on the beach at the southeast tip of Cape San Blas in Gulf County (29.665732, –85.346943). The bird was eventually

(on 24 Aug) posted online on birding sites and was identified as probably an Eastern Yellow Wagtail. Unfortunately, it could not be refound.

This is the first Florida record of this largely an Old World species. It is only the second record from the East Coast of North America; the first was in New York on 7 September 2008. The Eastern Yellow Wagtail breeds from central Asian eastwards, with a small population of breeders in western Alaska. It winters from Southeast Asia through Indonesia to north Australia. In migration it is a rare visitor to the west coast of North America (SE Alaska south to Baja California Norte). Although identification can be difficult because of confusion with Western Yellow Wagtail (*M. flava*), comments from Old World experts familiar with these wagtails strongly favored Eastern based on details of the plumage of the Florida bird (discussion on ABA Rare Bird Alert Facebook Page: https://www.facebook.com/groups/ABArare/permalink/3455945571132728).

Sprague's Pipit, *Anthus spragueii*

2020-1485 (JMu). John Murphy photographed this bird on 15 November 2019 at Apalachicola Regional Airport (Franklin County), where this species can be found most winters. In the winter of 2019–2020, up to three Sprague's Pipits were noted there until 8 March 2019.

This species was added to the Review List in 2016. One previous submission, also from Apalachicola Regional Airport, has been accepted by the FOSRC (#2019-1392; Kratter 2020). Since 2016, Apalachicola Regional Airport is the only site in Florida where Sprague's Pipits have been recorded, according to eBird. Prior to this, the species had been recorded in Okaloosa, Alachua, Seminole, and Miami-Dade counties between 2005 and 2016. Sprague's Pipit is a short grass specialist of central North America, breeding from Alberta and Saskatchewan south to eastern Wyoming and western South Dakota, and wintering from eastern Arizona east to western Louisiana and south to northern Mexico (AOU 1998).

Evening Grosbeak, *Coccothraustes vespertinus*

2021-1561 (PHu). On 4 December 2020, Paul Hueber audio-recorded an unusual call at his suburban home in Altamonte Springs (Seminole County). He sent the recordings to Matt Young of the Finch Research Network, who identified the calls as type-3 Evening Grosbeaks. The winter of 2020–2021 was a banner year for the southward movement of Evening Grosbeaks, with many birds reaching Tennessee, northern Georgia, and North Carolina (eBird). A pair was well described from Escambia County on 3 October 2020 but not submitted to the FOSRC (https://ebird.org/map/evegro?neg=true&env.minX=-102.071921621024 32&env.minY=26.971346678307004&env.maxX=-73.94692162102432&env.maxY=38.00509322287977&zh=true&gp=false&ev=Z&mr=1-12&bmo=1&emo=12&yr=range&byr=2020&eyr=2021).

This species was added to the Review List in 2016, and this is the first submission for this species to the FOSRC since. Evening Grosbeaks are notoriously nomadic, and only during exceptional years do they reach the southeastern United States. In February 1968, over 1,000 were estimated at St. Marks NWR (Wakulla County), but Greenlaw et al. (2014) only list four other records since those first Florida records in 1968.

Lapland Longspur, *Calcarius lapponicus*

2020-1439 (MO). On 1 October 2019, Mike Owtrowski photographed this basic plumaged bird on Siesta Key Beach in Sarasota County.

2020-1484 (JMu). On 25 November 2019, John Murphy photographed this basic plumaged bird at the Nature Conservancy's Phipps Preserve (29.90857, –84.43305) in Franklin County.

This species was added to the Review List in 2016, and one submission (FOSRC #2019-1430 from Duval County in Nov 2019) was accepted at our 2019 meeting. Greenlaw et al. (2014) considered it an irregular very rare visitor to the Panhandle and north Atlantic coasts, and casual farther south.

Harris's Sparrow, *Zonotrichia querula*

2020-1452 (MBr). Michael Brothers found and photographed this immature bird in the Eldora area of Canaveral National Seashore (Volusia County) on 9 November 2019. It was seen by a few other birders the same day but not relocated thereafter.

2021-1553 (JLe). Janet Leavens photographed this bird on 18 December 2020 on Gainer Road in rural Washington County (west of Falling Waters SP). Alan Moss reported a Harris's Sparrow in the same location two days prior according to the submitter.

2021-1558 (KSp). David and Jill Kaminski found this beautiful adult in Floral City (Citrus County) on 2 January 2021. It was photographed by Ken Spilios during its stay until 8 February 2021.

The FOSRC has previously accepted eight submissions: two sight reports (Escambia and Okaloosa counties), and five photographed birds (Okaloosa, Alachua, Volusia, Seminole, Hendry, and Hernando counties). Three earlier photographed birds (in Orange, Brevard, and Alachua counties) and a few sight reports have not been assessed by the FOSRC (Stevenson and Anderson 1994). This species breeds in the Arctic of western North America and winters in the southern Great Plains.

Western Spindalis, *Spindalis zena-*

2020-1476 (JMO). Joseph Montes de Oca found and photographed this male on 2 February 2020 at Robert King High Park in Miami (Miami-Dade County). It was seen by a few birders the same day but not refound after.

2020-1499 (MKr, LaM). This female was found and photographed by Mark Kramer on 5 May 2020 at Crandon Park on Key Biscayne (Miami-Dade County). It was seen by many birders during its stay until 10 May.

2020-1504 (SKa). This female was found and photographed by Stephen Kaplan on 5 May 2020 at the Fran Reich Preserve in Parkland (Broward County). It was not seen thereafter.

2020-1511 (HHe). This male was found and photographed by Hansel Herrera at Blue Hole SP on Big Pine Key (Monroe County) on 5 July 2020. It was seen by several other birders during its stay until 7 July.

2021-1563 (TLe). This male was found by Will Johnson and Joe Pescatore at Pelican Island NWR on 27 March 2021. It was present until 31 March and seen and photographed by many birders.

2021-1572 (VSp). On 21 April 2021, this male was seen at the J.W. Corbett WMA field office (Palm Beach County) by Valerie Sparling and Carol Rizkalla documented it with cell phone photographs.

This species, resident in the Bahamas and Cuba, was added to the Review List in 2016. One record was accepted by the FOSRC in 2016 (Kratter 2018a), three were accepted in 2017, although 15 or so were reported to eBird that year (Kratter 2018b), one was accepted in 2018 (Kratter 2019), and one was accepted in 2019 (Kratter 2020). Greenlaw et al. (2014) listed it as a regular visitor, with one breeding record (summer 2009 in Miami-Dade County). All records in Florida are from Southeast Florida (Indian River, Palm Beach, Broward, and Miami-Dade

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counties) and the Keys (Monroe County); the species has not been recorded in the ABA Area outside of Florida.

Bullock's Oriole, *Icterus bullockii*

2020-1468 (EW). Shirley Folse found this adult male in her Chuluota yard in Seminole County on 1 January 2020. It entertained many birders during its stay until 20 March.

2021-1538 (SRe). On 28 October 2020 Sandy Reed photographed this adult male at her home in Valrico (Hillsborough County). It stayed much of the winter, last being seen on 10 January 2021. Likely the same bird returned the following winter (e.g., https://ebird.org/checklist/S102525697).

2021-1545 (MSe). Mark Seganish found this hatch-year male near Lafayette Park in Tallahassee (Leon County) on 24 November 2020. It was not noted thereafter that winter, although an adult male was noted here the following winter (e.g., https://ebird.org/checklist/S104743399).

2021-1557 (KSp). On 25 January 2020, Ken Spilios photographed this second-year male in the Riverhaven community in Homosassa (Citrus County). It was not seen thereafter.

2021-1560 (AWK). On 16 January 2021, Andrew Kratter photographed this second-year female at this home in southeast Gainesville (Alachua County). Many birders saw it during its stay until 21 February. Identification was confirmed by Alvaro Jaramillo, who pointed out that female Bullock's Oriole can be separated from Baltimore Oriole (*I. gabula*) by lacking any orange or yellow in the undertail coverts.

2021-1566 (JRi). Jackie Richards photographed this apparent second-year male at her home in Naples (Collier County) on 4 April 2021. It stayed until 7 April.

The FOSRC has now accepted 29 previous submissions, 15 in the past ten years. Most were in the Panhandle (16) or north Peninsula (7, from Tampa north). The others were from Collier County (1, above), Osceola County (1), and Monroe County (3). Greenlaw et al. (2014) consider it an irregular very rare to rare migrant and winter visitor. The strong bias of records to males likely results from difficulty in separating female Bullock's and Baltimore orioles.

Hooded Oriole, *Icterus cucullatus*

2020-1455 (DBo). On 23 December 2019, David Gagne found and photographed this adult male at Weekiwachee Preserve in Hernando County. The bird was seen by scores of birders until it departed on 28 December 2019.

2021-1568 (BDC). On 20 April 2021, Brenda and Jerry Callaway found and photographed this adult male at Battery Worth at the Fort Pickens Area of Gulf Islands National Seashore (Escambia County). It was also seen by Bob and Lucy Duncan but not found thereafter.

These are the third and fourth records of this western North American species accepted for Florida. The two previous records were both from Santa Rosa County: a male October 2002 (FOSRC #2002-494; Bowman 2006) and another male January 2011 (FOSRC #2011-834; Kratter 2012b). All four accepted Florida records have been males.

Scott's Oriole, *Icterus parisorum*

2020-1480 (GSi). On 21 December 2019, Glenda Simmons photographed an unusual oriole in her yard that had been present the day before on Redfield Circle in Tallahassee (Leon County). The bird was eventually identified as a hatch-year male Scott's Oriole. The bird did not reappear at this location, but on 19 February 2020, Mark Castaneda found what was certainly the same bird at his yard on Wyoming Circle in Tallahassee, about 11 km WNW of Redfield Circle. Fortunately, the bird stayed there until 12 March 2020 allowing many birders to see it.

This is the first record for Florida of this species from the aridlands of southwestern North America. There are a few other scattered records in southeastern North America (Virginia in Mar 2020, North Carolina in Feb 2008, South Carolina in Jan 2016, Georgia in Jan 2020, and several in Louisiana).

Mourning Warbler, *Geothlypis philadelphia*

2020-1531 (KMa). This bird was found, photographed, and audio-recorded by Kyle Matera and Marcello Gomes at Spanish River Park (Palm Beach County) on 12 October 2020. It stayed until 20 October.

The FOSRC added this species to the Review List in 2016, and one bird was accepted at our 2019 meeting (FOSRC #2019-1343; 24 Sep in Miami-Dade County). The species, however, is more frequently reported and eBird has 12 additional observations (two records and 10 sight reports, all but one from the fall) from 2011–2021. Greenlaw et al. (2014) considered it an almost regular, rare to very rare transient.

MacGillivray's Warbler, *Oporornis tolmiei*

2021-1537 (HGo, MSl, RGu, NFo). This bird was caught and photographed during mist-net operations at Tree Top Park in Broward County on 24 October 2020. It was also seen the following day by several birders.

The FOSRC has now accepted 13 submissions of MacGillivray's Warbler. All except one have been from South Florida (Lee, Collier, Palm Beach, Broward, Miami-Dade, and Monroe counties); the exception was in April 2008 in Pinellas County (FOSRC#2008-682; Kratter 2010a). Greenlaw et al. (2014) considered it an irregular, very rare winter visitor.

"Audubon's" Yellow-rumped Warbler, *Setophaga coronata audubonii*

2020-1490 (TGr). Tedd Greenwald photographed this male molting into alternate plumage in High Springs (Alachua County) on 30 March 2020.

The FOSRC has now accepted ten submissions of this distinctive subspecies group from western North America. Greenlaw et al. (2014) considered it to be an irregular, very rare transient or winter visitor.

Black-throated Gray Warbler, *Setophaga nigrescens*

2020-1450 (KSp). Mike and Effie Smith photographed this bird 25 October 2019 at their water feature in Inverness (Citrus County). It was only seen that one day.
2021-1552 (JeG). On 23 December 2020, Jeff Graham found and photographed this bird on the Florida Trail near Camp Blanding and Lake Lowry (29.839036, –81.98411620) in Clay County. 2021-1556 (RGu). This male was found by Bob Wallace and Mitchell Harris on Shiloh Marsh Road at Merritt Island NWR (Brevard County) on 18 September 2020. It was seen and photographed by many during its stay until 21 January 2021.

This species was added to the Review List in 2016. One submission (FOSRC #2016-1250, Pinellas County, Oct 2014) was accepted at our 2017 meeting (Kratter 2018b), and another (FOSRC # 2017-1184, Broward County, Oct 2016) was accepted at our 2018 meeting (Kratter 2018b). Although Greenlaw et al. (2014) stated that there was nearly 100 records or reports of this species for Florida, numbers over the last decade indicate that the species has sharply declined in frequency in Florida.

Townsend's Warbler, *Setophaga townsendi*

2020-1488 (JoG). On 21 March 2020, John Groskopf photographed this likely female at Bay Street Park in Osprey (Sarasota County). It was present until 27 March 2020 and seen by several birders.

2020-1493 (GSi). Gael Silverblatt found and photographed this bird on 10 April 2020 in Lake Worth (Palm Beach County). It was not refound.
2020-1523 (MBe). Mark Berney photographed this bird in the Francis S. Taylor Wildlife Management Area at Everglades Parkway Rest Area on Interstate 75 (Broward County), on 29 August 2020. It was not refound.
2020-1555 (RGu, JoG). On 27 November 2020, John Groskopf photographed this bird at the same site as FOSRC #2020-1488 above (Bay Street Park in Osprey). It was present until 13 March 2021, delighting scores of birders. It seems likely it was the same female as the previous spring.

Six submissions of Townsend's Warbler, a medium distant migrant in western North America, were accepted by the FOSRC before 1995; it was then removed the Review List. In 2016 the FOSRC changed criteria for placement on the Review List and the species was included on the List again. Since then, one from Monroe County was accepted in 2018 (FOSRC #2018-1301; Kratter 2019), and one from Miami-Dade County was accepted in 2019 (FOSRC #2019-1342; Kratter 2020). Greenlaw et al. (2014) stated that it is an irregular, very rare winter visitor.

Hermit Warbler, *Setophaga occidentalis*

2020-1525 (LaM, WCT, KMa). On 23 September 2020, David Gabay found this warbler at Spanish River Park in Boca Raton (Palm Beach County). It was initially posted as a Bay-breasted Warbler (*S. castanea*), but John Groskopf posted that he thought it may be a Hermit Warbler. Over the next two days, the bird was refound and better images were taken that showed the mostly clear yellow head with only slight darkening of the auriculars, grayish white throat with only a hint of yellow, pale grayish white underparts with no flank streaking, and grayish unstreaked back. Recordings were made of its chip note.

This is the first record for Florida for this medium distant migrant form the mountains of Western North America. Aside from a record in extreme southwest Louisiana, there are no records in the southeastern United States. However, eBird shows a few scattered records farther north, including Missouri, Maryland, around the Great Lakes, New York, Quebec, in New England, and in the Atlantic provinces of Canada.

Black-headed Grosbeak, *Pheucticus melanocephalus*

2021-1548 (KStm NFo, RGu). On 15 December 2020, Karen Stanmore photographed this young male on Innerarity Point Road in Pensacola (Escambia County). It was seen by a few other birders during its stay until 20 December.
2021-1550 (WCa). On 16 December 2020, Wayne Caswell photographed this bird, likely a young male, on Riverboat Drive in Tampa (Hillsborough County). It was not refound.
2021-1559 (BLo). On 18 February 2021, Bruce Locke photographed this bird, also a young male, on Welwyn Lane in Tallahassee (Leon County). It was seen through 6 March by several birders.

These are the first accepted submissions of Black-headed Grosbeak by the FOSRC since the species was added to the Review List in 2016. An April 1987 bird (FOSRC #1987-122) was accepted by the FOSRC before the species was removed from the Review list. Greenlaw et al. (2014) considered this western North American migrant an almost regular, rare migrant and winter resident.

Lazuli Bunting, *Passerina amoena*

2020-1533 (LMa). This hatch-year male was found and photographed by Monica Hesles at A.D. Doug Barnes Park in Miami (Miami-Dade County) on 17 October 2020 and was seen by many birders until 20 October.

2021-1564 (BKn, BPr). On 22 March 2021, Billie Knight photographed this male molting into alternate plumage visiting feeders at her home in Palmetto (Manatee County). Chris Wood, an eBird reviewer, confirmed the identification, and it was seen by many during its stay until 11 April.

The FOSRC has accepted 16 submissions of Lazuli Bunting. Most of these were adult males. Greenlaw et al. (2014) considered this western North American species an irregular, very rare migrant and winter resident in Florida.

Bananaquit, *Coereba flaveola*

2020-1528 (KSe). On March 6 2020, Karen Seward photographed this remarkable bird on St. George Island (Franklin County) in Florida's Panhandle. All previous records of this widespread Caribbean and Neotropical species in Florida and the ABA Area have been on the Atlantic Coast of south Florida (Brevard County south) and the Florida Keys.

This species was added to the Review List in 2016. Four records were accepted in 2017 (Kratter 2018b), although seven different Bananaquits were reported in Florida that year (eBird), one record was accepted in 2018 (Kratter 2018b), and four were accepted in 2019. Greenlaw et al. (2014) listed this widespread Neotropical species as an irregular casual to very rare winter visitor. It is abundant in the Bahamas and on islands off Cuba.

Black-faced Grassquit, *Melanospiza bicolor*

2020-1495 (BWh). On 11 January 2020, Bryan White photographed this male at John Pennekamp Coral Reef SP on Key Largo (Monroe County). It was not refound.

2020-1496 (MJo). On 21 April 2020, Matthew Jolley photographed this male at Blue Hole SP on Big Pine Key (Monroe County). A grassquit has been observed here continuously through May 2022. In April 2021, a second bird was noted and one male was seen constructing a nest (https://ebird.org/checklist/S85886455). This is likely the same bird that stayed at this site for the summer in 2019 (FOSRC #2019-1428; Kratter 2020).

2020-1502 (LaM). On 14 May 2020, this adult male was noted singing by the Homestead entrance of Everglades National Park (Miami-Dade County). The bird was seen by many in this area until 27 June 2020.

2020-1505 (BSh, AHe). On 20 May 2020, Bob Showler found this bird, likely an adult female, at the Long Pine Key Campground Amphitheater in Everglades National Park (Monroe County). It was later photographed by Alberto Hernandez carrying nest material. It was present until 6 June 2020.

The FOSRC has accepted nine previous records of this species, all from Southeast Florida (one each from Broward and Palm Beach County, four from Monroe County, and three from Miami-Dade; Kratter 2020). There are also three older specimen records from Miami-Dade County (Greenlaw et al. 2014). The Black-faced Grassquit, a widespread species in the Bahamas and the Caribbean, is considered a casual winter visitor by Greenlaw et al. (2014).

Not Accepted

American Black Duck, *Anas rubripes*

2021-1565. This pair of ducks was photographed at a retention pond in Port St. Lucie (St. Lucie County) on 3 April 2021. The Committee felt that wide buffy fringes on most body feathers were more indicative of Mottled Duck (*A. fulvigula*). This species was added to the Review List in 2016. One report (FOSRC #2016-1149, Alachua County, Nov 2011) was accepted by the FOSRC in 2016, a

videotaped group of 18 (#2017-1197, Wakulla County, Dec 2016; Kratter 2018b) was accepted in 2017, and one from Volusia County in January 2018 was accepted in 2018 (#2018-1336; Kratter 2019). Records on eBird indicate that this species is a rare but regular winter visitor in the Panhandle, particularly at St. Marks NWR. Greenlaw et al. (2014) listed it as an occasional to rare migrant and winter resident in the Panhandle and north peninsula.

Bar-tailed Godwit, *Limosa lapponica*

2020-1483. This bird was photographed at St. Marks NWR on 10 February 2020. The Committee thought that the white spots on the wings coverts and barred secondaries were more in line with a Greater Yellowlegs (*Tringa melanoleuca*).

Sabine's Gull, *Xema sabinii*

2021-1606. This bird was observed for about 10 seconds as it flew along Miami Beach on 20 November 2021. The description is very brief, and the observer remarked that the identification fell solely on the white triangles in the wings as it flew above the surf. The Committee felt the description did not exclude Black-legged Kittiwake (*Rissa tridactyla*).

Yellow-legged Gull, *Larus michaehellis*

2020-1481. On 5 January 2020, this first-cycle bird was photographed and video-recorded at the large gull concentrations that gather in the afternoons at Daytona Beach Shores (Volusia County). The Committee felt that this bird is likely a Lesser Black-backed Gull (*L. fuscus*), albeit one with a quite large bill.

Yellow-legged Gull is a western Palearctic species that is a regular vagrant to the Atlantic Canadian provinces. Almost all accepted records are adults (http://birdingnewfoundland.blogspot.com/2011/02/yellow-legged-gulls-of-newfoundland.html). Identification of non-adults is especially difficult, particularly separating them from Herring (*L. argentatus*) x Lesser Black-backed Gull hybrids. Of six submitted records, the FOSRC has yet to accept any Yellow-legged Gull in Florida.

Elegant Tern, *Thalasseus elegans*

2020-1444. This bird was photographed at Siesta Key Beach (Sarasota County) 15–19 October 2019. The black in the nape and hind crown does not extend above the eye as in Elegant Tern. The size, somewhat larger and longer billed than adjacent Cabot's Sandwich Terns (*S. a. acuflavidus*), and black in the nares and bill base, indicate that the bird may be a hybrid Elegant x Cabot's Sandwich Tern. This pairing has been observed on Florida's Gulf coast (Greenlaw et al. 2014).

2020-1529. This winter plumaged tern was photographed 30 September–1 October at Siesta Key Beach (Sarasota County). Unlike Elegant Terns, this bird has some smudgy black in the bill in the nares, the black cap recedes from the top of the head farther behind the eye, and the bill is not long enough. The Committee thought it likely was a hybrid Elegant x Cabot's Sandwich Tern.

Elegant/Cayenne Tern, *Thalasseus elegans*/*T. sandvicensis eurygnatha*

2020-1494. This breeding plumaged tern was photographed 10 April at Courtney Campbell Causeway Beach (Pinellas County). It was submitted as either Cayenne Tern or an Elegant Tern. The smudgy black in the bill, more extensive than 2020-1444 above, indicate a likely hybrid Elegant x Cabot's Sandwich Tern.

Cape Verde Shearwater, *Calonectris edwardsii*

2021-1578. This bird was photographed at Playalinda Beach at Canaveral National Seashore (Brevard County) on 21 May 2021. The photos, which are fairly

sharp for a pelagic bird photographed from land, show both dorsal and ventral aspects of a *Calonectris* shearwater in the Cory's Shearwater complex. Of the three taxa in this complex, Cory's Shearwater (*C. d. borealis*) is a common offshore visitor to Florida from its breeding areas on islands in the North Atlantic (Azores, Madeira, Canary Islands), Scopoli's Shearwater (*C. d. diomedea*, often considered a separate species) is an occasional visitor to Florida waters from breeding areas in the Mediterranean Sea, and Cape Verde Shearwater (*C. edwardsii*) has not been recorded from Florida but is known from one record off North Carolina (Patteson and Armistead 2004); it breeds in the Cape Verde Islands off North Africa. Identification in this complex is often difficult, especially with single birds that do not have reference for size and proportions (Howell 2012). The ventral surfaces of the outer primaries are entirely dark, eliminating Scopoli's Sheawater. The Cape Verde can be differentiated from the larger Cory's on its size and smaller, mostly dark bill, compared to the stout yellow-olive bill of Cory's. The five submitted photos show variation in apparent bill color, some appear light and some appear dark, which may be due to reflective light. The bill looks thin and short, but female Cory's approach male Cape Verde in size. Overall, the Committee felt that a first State record would require photos with better resolution so that size and color can be better assessed.

Western Reef Heron, *Egretta gularis*

2021-1603. What has been presumably the same heron or egret has seen around Florida for several years. The submitted photographs were taken 25 March 2013 at Blackpoint Wildlife Drive in Merritt Island NWR. (Brevard County). Breeding plumage plumes on the head and back indicate an adult bird, and not a piebald intermediate immature heron transitioning between dark and pale stages. Although the long bill and breeding plumes fit Western Reef Heron, the Committee felt that the bird better fit a hybrid than a Western Reef Heron. The two long head plumes indicate that Little Egret (*E. garzetta*) may be one of the parents. The long bill and patches of dark plumage may indicate Tricolored Heron (*E. tricolor*).

The Western Reef Heron is an Old World species with some history of vagrancy to the New World, particularly in the Lesser Antilles, Tobago, and northeast United States (Maine, New Hampshire, Massachusetts, New York, New Jersey: eBird)

Golden Eagle, *Aquila chrysaetos*

2020-1469. This bird, described as an adult with all dark plumage and no white in underwings or on tail and a golden nape, was seen on Lake Apopka Wildlife Drive on 17 January 2020. The bird was seen, at quite a distance (0.4–0.8 km), both perched and in flight. Although the brief description matched Golden Eagle, key features were not included for differentiating from Bald Eagle (*Haliaeetus leucocephalus*), such as the size of the bill, flight profile, and wing shape.

2020-1473. This was also described as an adult, with all dark plumage and no white in underwings or on tail. It was seen on 5 February 2020 near Miccosukee in Leon County. The description describes the flight profile as completely flat. The Committee felt that this flight profile is a better match for Bald Eagle, as Golden Eagles usually fly with a slight dihedral.

Red-tailed "Harlan's" Hawk, *Buteo jamaicensis harlani*

2019-1361. This soaring dark *Buteo* was photographed at the Tram Holding Ponds in Leon County on 26 February 2021. The Committee voted to Table it at our 2019 meeting to get outside expert opinion. Bill Clark, and expert on raptor identification, wrote: "While I cannot be absolutely certain, the juvenile in these photos is most likely a dark Harlan's Hawk. The outer primary banding and overall plumage are consistent with that taxon." The Committee felt that for a

bird so rare in Florida (see below), it would be best to be more certain of the identification.

2021-1600. This crisp pale morph juvenile was photographed 9 September on Lake Pointe Blvd. in Sarasota. The Committee felt that a Harlan's Hawk should show more barring in the outer primaries, and that this bird was likely an Eastern (*B. j. borealis*) or Florida (*B. j. umbrinus*) Red-tailed Hawk.

The Harlan's subspecies of Red-tailed Hawk has two previous records in Florida and is recorded sporadically (Greenlaw et al. 2014); all three submissions of the taxon to the FOSRC have not been accepted.

GILA WOODPECKER, *Melanerpes uropygialis*

2020-1510. This bird was photographed in Bonita Springs (Collier County) on 27 June 2020. The Committee felt that the photographs showed a juvenile Red-bellied Woodpecker (*M. carolinus*) that has yet to develop much red in the crown and nape (a few red feathers are starting to emerge).

Gila Woodpeckers are residents in the arid deserts of the southwestern United States and northwestern Mexico. The closest records to Florida are in southwestern New Mexico (eBird), and the species shows almost no signs of even short-distance vagrancy.

YELLOW-BELLIED FLYCATCHER, *Empidonax flaviventris*

2020-1435. This silent bird was described from an observation at St. Marks NWR on 21 August 2019. The observer made his identification based primarily on throat color (yellowish). During fall migration, some fresh-plumaged Acadian Flycatchers (*E. virescens*) can approach Yellow-bellied in throat color. Identification is best made using a combination of throat color, eye ring shape, primary extension, pattern in the secondaries, and vocalizations.

2020-1447. This bird was audio-recorded and photographed in Pasco County on 20 October 2019. The vocalizations are faintly audible. The bird appears quite yellow underneath, but critical details of primary length, and pattern of the secondaries cannot be assessed from the angle. The vocalizations are difficult to differentiate from Eastern Wood-Pewee and the submission was tabled in 2020 to ask if the observer heard and saw the bird simultaneously. He answered that the bird and the call appeared to be coming from the same area, but he did not actually see the bird calling. The Committee felt that there was too much uncertainty about the identification to be accepted.

2020-1482. This silent bird was photographed at Upper Brooker Creek Buffer Preserve in Hillsborough County on 24 October 2019. The photographs are a bit overexposed and it is difficult to see plumage colors and contrasts. The Committee felt that the primary projection was more in line with an Acadian Flycatcher.

2020-1497. This bird was heard but not seen on 25 April 2020 at Pinecraft Park in Sarasota (Sarasota County). The observer stated that they were familiar with the similar "tuur-ree" calls of both Eastern Wood-Pewee (*C. virens*) and Yellow-bellied Flycatcher, but the Committee has no way to determine the breadth of this experience.

2020-1518. This silent bird was observed on 7 September 2020 at Lake Jackson in Tallahassee (Leon County). The Committee felt that the identification relied too heavily on throat color.

2020-1520. This silent bird was observed 6 September 2020 at Black Creek in Leon County. The description stated that the bird was much brighter yellow than the Acadian Flycatchers that they see in the summer at this location. However, fall-migrant Acadians are in fresh plumage, which is much brighter than the worn summer plumage seen on the breeding grounds.

2021-1535. This silent bird was photographed at Red Bug Slough Preserve in Sarasota County on 7 October 2020. Although the photographs and description lean toward identifying this bird as Yellow-bellied Flycatcher (versus Acadian Flycatcher), the primary projection is difficult to judge because of the angle but appears too short for Yellow-bellied, the throat appears more grayish, and the black bar at the base of the secondaries is not as distinct.

Willow Flycatcher, *Empidonax traillii*

2020-1498. This bird was observed and heard 2 May 2020 at Leffis Key in Manatee County. The observers did not have previous experience with the species, except for recordings of calls. The Committee felt that identification of *Empidonax* flycatchers by call notes is subtle, and experience is a key component for learning differences. For *Empidonax*, and especially Alder and Willow flycatchers, the Committee prefers submissions with audio-recordings when possible.

Bewick's Wren, *Thryomanes bewickii*

2020-1508. This bird was seen and heard at the Youth Camp on St. Georges Island (Franklin County). A sketch and description were submitted. Details were rather sparse. For instance, the tail is only described as long, and does not include details of the pattern, which can help differentiated it from the similar Carolina Wren (*Thryothorus ludovicianus*). The calls are only described as "buzzy and mechanical," which does not aid in differentiating them from other wren species. The Committee felt that the rarity of the species in eastern North America requires either documentation or a complete detailed description.

Although Bewick's Wren was formerly a fairly common winter resident on the Gulf Coast of Texas to Florida's Panhandle (Greenlaw et al. 2014), the eastern population in North America has collapsed since the 1950s. The FOSRC has accepted one sight report (FOSRC #2001-454; Bowman 2004) since a bird observed at Ft. Pickens State Park (Escambia County) on 29 October 2001. The last documented record in Florida was a tower kill in Leon County on 13 October 1965 (Greenlaw et al. 2014).

Bicknell's Thrush, *Catharus bicknelli*

2021-1594. This bird was heard giving flight notes ("high-pitched sharp descending vreep, similar in quality to Gray-cheeked Thrush flight call but higher pitched") during pre-dawn migration on 26 September 2021 at Avon Park Air Force Range (Highlands County). Although the submitter has worked on Bicknell's Thrush projects in the past, identifying flight calls, even with experience, is difficult. The Committee felt that calls should be audio-recorded so that differences in pitch could be analyzed objectively.

Phainopepla, *Phainopepla nitens*

2021-1587. This bird was described from an observation on 14 September 2021 in Vero Beach (Indian River County). The brief description is as follows: "Black bird, about the size of a large cardinal or grackle, with a black tuft on its head." The Committee felt the description was incorrect, as Phainopeplas are smaller than grackles or cardinals, and was missing key features (noticeable white in the wings, small bill, glossy plumage).

The Phainopepla is a short-distance migrant of the desert southwest with few records of long-distance vagrancy. The nearest records to Florida are one on the upper Gulf Coast of Texas, one from Wisconsin, two from Ontario, and one from Massachusetts.

White Wagtail, *Motacilla alba*

2020-1509. This bird was observed at close range (5 m) but without binoculars at the Youth Camp on St. Georges Island (Franklin County) on 18 October 2020. A sketch and details were submitted by the observer. The Committee felt a few things were troubling about this report. First the habitat was described as a picnic area in the pines, but White Wagtails are rarely away from the water's edge, and not likely to be in the hammock on picnic tables. Second, the description seemed contradictory at times, with parts of the bird in full breeding plumage (solid black back), but other parts more in winter plumage (white breast with some black spotting). A black-backed White Wagtail vagrant anywhere in the United States would almost certainly be the race from eastern Russia and Alaska, which has a notable black line through the eye. On eBird, five White Wagtails are listed for May–June in the lower 48 of the United States, all are from the Washington (1) or California (4), and all are males in full breeding plumage with strong black eyelines and expansive black breast patches.

Florida has two accepted records of White Wagtail: the first (FOSRC #2007-634), a nominate bird from the western Palearctic, photographed on 18–22 March 2007 in Pasco County; and the second (FOSRC #2008-703), a male from the subspecies *M. a ocularis* of eastern Asia and Alaska, was photographed 28 October 2008 in Marathon (Monroe County).

American Tree Sparrow, *Spizelloides arborea*

2020-1489. This bird was observed at Tower Pond at St. Marks NWR (Wakulla County) on 20 March 2020. The details, including lack of eye ring, rufous line through eye on gray face, white underparts with a charcoal spot in the center, possibly indicated an American Tree Sparrow, but most of the Committee felt that the details provided were not conclusive. We felt that an American Tree Sparrow may have been seen (one member even voted to accept), but the lack of some details, especially the bicolored bill and the pattern in the wings, gave pause. Some members felt that the bird may have been a Swamp Sparrow (*Melospiza georgiana*) with some breast feathers missing, creating a dark spot. Attempts to relocate it were unsuccessful.

Four records have been accepted by the FOSRC: one photographed April 1998 from Wakulla County (FOSRC #1998-386; Bowman 2000), one October 2003 from Escambia County (FOSRC #2003-521; Bowman 2006), one photographed in Brevard County in April 2012 (FOSRC #2012-888; Greenlaw 2016b), and one photographed in May 2018 in Monroe County (2017-1255; Kratter 2018b). The species regularly winters much farther to the north (in the east south to Missouri, northern Kentucky, West Virginia, and northern Virginia) with an occasional bird farther south.

"Audubon's" Yellow-rumped Warbler, *Setophaga coronata audubonii*

2020-1454. This bird was observed on 22 December 2019 at Black Point Wildlife Drive in Merritt Island Wildlife Refuge (Brevard County). The Committee felt that the brief description likely pertained to an Audubon's Warbler but did not rule out the possibility of intergrade Myrtle (*Setophaga coronata coronata*) x Audubon's, which have shown up in Florida.

Western Spindalis, *Spindalis zena*

2019-1405. This bird was photographed with a cell phone on 14 May 2019 in Palm Beach Garden. It is difficult to make out any details in the photos. The description provided was very brief, mentioning striped head, white in wings, yellow throat,

and blunt black bill but not giving any indication of size, or details of pattern. The vote was unresolved at our 2019 meeting. Attempts to get more written details from the observer were unsuccessful. In 2020, the Committee felt that the details and photographs were not adequate to document this identification.

Unresolved or Tabled

Whooper Swan, *Cygnus cygnus*

2021-1611. This bird was photographed on a pond adjacent to I-95 in Brevard County on 23 February 2021. The Committee tabled the vote to better determine subspecies identity and if the swan may have escaped from captivity.

Great White Pelican, *Pelecanus onocrotalus*

2020-1472. What is almost certainly the same bird that first appeared in Lee County in February 2016 (FOSRC #2016-1118) and seen again the following Spring in 2018, reappeared on 23 January 2020 on West Gator Creek Road in Merritt Island NWR (Brevard County). The bird wandered in the general area of the refuge and was widely seen until 26 February 2020. The original submission in 2016 was eventually not accepted (Kratter 2018b), based on the unlikely prospect of the species crossing the Atlantic from its native range in Asia and Africa. The lack of any records of Great White Pelicans in the Macaronesian Islands of the eastern Atlantic makes hypotheses of cross-Atlantic flights less tenable. Nonetheless, this bird did not exhibit any signs that it originated from captivity (bands, feather wear, no-wild behavior), the non-zoo captive population is likely very small, and the species is a regular vagrant to western Europe (Jiguet et al. 2008).

At our 2020 meeting, a different hypothesis regarding origin of the pelican was put forth. In 2021, the ABA Checklist Committee (Pyle et al. 2021) accepted North American records of Hooded Cranes (*Grus monachas*); this species has a similar breeding distribution in central Asia to that of Great White Pelicans. It was thought that these cranes had wandered or overshot northeast and joined a Sandhill Crane (*Antigone canadensis*) population in northwest Russia or Alaska and then migrated with them to the central United States. The Committee entertained the idea that a Great White Pelican could similarly overshoot their breeding range and end up in Canada with American White Pelicans (*P. erythrorhynchos*) and then migrate to Florida. This hypothesis does not rely the pelican making a long cross-oceanic flight, but American White Pelican breeding areas are much farther away from central Asia than those of Sandhill Cranes. The resulting vote was unresolved.

Sandwich "Cayenne" Tern, *Thalasseus sandvicensis eurygnathus*

2021-1576. This bird was photographed on the beach at Boyton Beach Inlet (Palm Beach County) on 5–6 May 2021. The submitted photographs are a bit distant. The Committee tabled the submission because better photographs are likely available but not submitted.

Red-masked Parakeet, *Psittacara erythrogenys*

2019-1413. The Florida population of this introduced parakeet, native to southeast Ecuador and northwest Peru was described by Chatfield-Taylor and Epps (2020). The manuscript presents evidence that this species may meet FOSRC criteria to be considered an Established Exotic. Approximately 17,000 to 30,000 individuals were imported into the United States between 1983 and 1985 (Traffic U.S.A. 1987, Best et al. 1995). Nesting began in the Miami area in the 1990s, although wild

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populations were reported back to 1986. Chatfield-Taylor and Epps (2020) showed that the populations have been expanding dramatically: the Miami-Dade County populations expanded from 8 km^2 in 1997 to 53 km^2 by 2018, and a separate population in Ft. Lauderdale (Broward County) expanded from 5 km^2 to 41 km^2 between 2006 and 2018. At the time of the 2019 meeting, the paper had yet to be accepted for publication and the Committee submission was tabled. At our 2020 meeting the vote was unresolved, with some members concerned that the population did not meet FOSRC criteria to be considered established. At our 2021 meeting, Committee member Larry Manfredi felt that he could mount a census of breeding colonies in south Florida to get a more accurate estimate of population size. As a result, the submission was tabled.

Western Wood-Pewee, *Contopus sordidulus*

2021-1593. This bird was photographed and audio-recorded on 30 September–1 October 2021 at South Lido Key Beach Park in Sarasota County. After reviewing on-line audio recordings, the Committee thought that calls many birders consider diagnostic for Western Wood-Pewee apparently can be given by Eastern Wood-Pewee. The Committee tabled the submission to await consultation with experts more familiar with the range of vocalizations in both wood-pewee species.

House Crow, *Corvus splendens*

2018-1320. The House Crow is resident in the Indian Subcontinent and Southeast Asia. Populations have become established at several seaports across the globe, almost certainly arising from birds that arrived by riding cargo ships from their native range. House Crows have been present south of Tampa Bay in Manatee County (six birds from 2009–2010) and Sarasota County (up to four birds since at least 2001; Greenlaw et al. 2014). Beginning in late April 2018, a House Crow in Nokomis Beach (Sarasota County) paired with a Fish Crow and nested. This bird is possibly one of the same birds present since 2001. Like other House Crows away from their native range, these birds in Florida are thought to be or have derived from birds that rode ships to deep-water ports, such as Port Manatee.

The identification of the birds has not been questioned. According to the bylaws of the FOSRC, the individual must represent a "natural appearance," which is defined as:

> The reasonably plausible appearance of a species from its home range without the intentional intervention of man. A bird which passively rides a ship or other man-made conveyance shall be considered to have occurred naturally if it is not confined or restrained at all during its passage, and if its survival en route is not based upon significant human intervention such as continual provision of food and water actually consumed. Natural Appearance need not (indeed, usually cannot) be proven; it need only be reasonably plausible based upon the biology of the species and any other known relevant factors including the circumstances of its appearance.

Thus, the bylaws allow species to be added to the Official List that may have been transported here by riding ships, under certain conditions. One of the main products brought to Port Manatee is tropical fruit (http://www.portmanatee.com/about-us/port-facts/) and it seems feasible that crows could easily survive on long ocean crossings on a ship laden with tropical fruit. The question is whether this access to fruit should be considered "continual provisioning" and whether the birds may have been "confined" in a hold or other compartment. For the second year, the FOSRC vote was unresolved. In 2019 three votes to accept considered that the definition of natural appearance had been met; four votes to not accept deemed that the appearance of House Crows in Florida was not natural because crows could not survive a long sea-

crossing without provisioning. Similar unresolved outcomes resulted from votes at our 2020 and 2021 meetings.

No state or provincial Committee in the ABA Area has added House Crows. They have not been considered by the ABA Checklist Committee. It should be noted that other records committees may have varying definitions of natural appearance and may or may not allow some degree of ship assistance.

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Income		
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